

S.N. 89/759781

=> file hcaplus

FILE 'HCAPLUS' ENTERED AT 09:56:56 ON 03 MAR 2004

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FILE COVERS 1907 - 3 Mar 2004 VOL 140 ISS 10

FILE LAST UPDATED: 2 Mar 2004 (20040302/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d que 135

L1 ( 19)SEA FILE=REGISTRY ABB=ON (107-35-7/BI OR 124-38-9/BI OR 127-17-3/BI OR 14265-44-2/BI OR 22537-22-0/BI OR 471-34-1/BI OR 50-99-7/BI OR 546-93-0/BI OR 556-50-3/BI OR 56-40-6/BI OR 56-86-0/BI OR 59-23-4/BI OR 60-00-4/BI OR 64-19-7/BI OR 74-79-3/BI OR 77-92-9/BI OR 9005-79-2/BI OR 9007-28-7/BI OR 97-67-6/BI)

L2 ( 1)SEA FILE=REGISTRY ABB=ON L1 AND CARBON DIOXIDE

L3 ( 18)SEA FILE=REGISTRY ABB=ON L1 NOT L2

L4 ( 65226)SEA FILE=HCAPLUS ABB=ON WASTE(4A)GAS?

L5 ( 443361)SEA FILE=HCAPLUS ABB=ON L2 OR CO2 OR CARBON DIOXIDE

L6 ( 8483)SEA FILE=HCAPLUS ABB=ON L5(L)REM/RL

L7 ( 68271)SEA FILE=HCAPLUS ABB=ON L5(6A)GAS?

L8 ( 4157)SEA FILE=HCAPLUS ABB=ON L6 AND L7

L9 ( 648)SEA FILE=HCAPLUS ABB=ON L4 AND L8

L10 ( 85)SEA FILE=HCAPLUS ABB=ON L9 AND CARBONATE?

L11 ( 7219)SEA FILE=HCAPLUS ABB=ON L2(L)REM/RL

L12 ( 76)SEA FILE=HCAPLUS ABB=ON L10 AND L11

L13 ( 553636)SEA FILE=HCAPLUS ABB=ON L3

L14 ( 28)SEA FILE=HCAPLUS ABB=ON L12 AND L13

L15 ( 1831)SEA FILE=HCAPLUS ABB=ON (DEXTROSE OR GLYCINE OR GLUTAMIC OR GALACTOSE OR EDTA OR ACETIC ACID OR ARG OR ARGININE) (5A)WASTE?

L16 ( 7539)SEA FILE=HCAPLUS ABB=ON (TAURINE OR CaCO3 OR CALCIUM CARBONATE OR Mg2CO3 OR MAGNESIUM CARBONATE OR GLYCOGEN OR CHONROITIN SULFATE OR PHOSPHATE# ) (5A)WASTE?

L17 ( 13)SEA FILE=HCAPLUS ABB=ON L12 AND (L15 OR L16)

L18 ( 39)SEA FILE=HCAPLUS ABB=ON L12 AND (HYDRAT? OR H2O OR AQ OR AQUEOUS OR WATER?)

L19 ( 7)SEA FILE=HCAPLUS ABB=ON L18 AND (SEQUESTER? OR EXTRACT?)

L20 ( 5)SEA FILE=HCAPLUS ABB=ON L18 AND FIX?

L21 ( 29)SEA FILE=HCAPLUS ABB=ON L18 AND (AIR(W) POLLUT?)/SC

L22 ( 46)SEA FILE=HCAPLUS ABB=ON L14 OR L17 OR L19 OR L20 OR L21

L23 ( 41)SEA FILE=HCAPLUS ABB=ON L22 AND AIR/SC, SX

L24 ( 2044)SEA FILE=HCAPLUS ABB=ON L4(6A)L5

L25 ( 33)SEA FILE=HCAPLUS ABB=ON L23 AND L24  
 L26 ( 38237)SEA FILE=HCAPLUS ABB=ON WASTE GASES/IT  
 L27 ( 30)SEA FILE=HCAPLUS ABB=ON L25 AND L26  
 L28 ( 1)SEA FILE=HCAPLUS ABB=ON L25 AND CARBONIC  
 L29 ( 2)SEA FILE=HCAPLUS ABB=ON L18 AND CARBONIC  
 L30 ( 2)SEA FILE=HCAPLUS ABB=ON L12 AND CARBONIC  
 L31 ( 17)SEA FILE=HCAPLUS ABB=ON L9 AND BICARBONATE?  
 L32 ( 11)SEA FILE=HCAPLUS ABB=ON L11 AND L31  
 L33 ( 2)SEA FILE=HCAPLUS ABB=ON L32 AND CARBONIC  
 L34 ( 13)SEA FILE=HCAPLUS ABB=ON L31 AND (AQ OR AQUEOUS OR WATER? OR  
 H2O OR HYDRAT?)  
 L35 40 SEA FILE=HCAPLUS ABB=ON (L27 OR L28 OR L29 OR L30) OR L33 OR  
 L34

=> file wpix  
 FILE 'WPIX' ENTERED AT 09:57:08 ON 03 MAR 2004  
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FILE LAST UPDATED: 2 MAR 2004 <20040302/UP>  
 MOST RECENT DERWENT UPDATE: 200415 <200415/DW>  
 DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

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 SDIS USING THE TIME RANGE CODE WILL NEED TO BE UPDATED.  
 FOR FURTHER DETAILS: <http://thomsonderwent.com/chem/polymers/> <<<

=> d que 151  
 L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR  
 DISPOS?)  
 L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?  
 L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37  
 L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)  
 L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC  
 L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR  
 SEQUESTER? OR FIX?)  
 L44 340 SEA FILE=WPIX ABB=ON L37 AND L43  
 L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)  
 L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC

L48 6 SEA FILE=WPIX ABB=ON L42 OR L47  
 L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?  
 L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC  
 L51 13 SEA FILE=WPIX ABB=ON L48 OR L50

=> file compendex

FILE 'COMPENDEX' ENTERED AT 09:57:22 ON 03 MAR 2004

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FILE LAST UPDATED: 3 MAR 2004

<20040303/UP>

FILE COVERS 1970 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN  
 THE BASIC INDEX >>>

=> d que 152

L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR  
 DISPOS?)  
 L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?  
 L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37  
 L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)  
 L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC  
 L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR  
 SEQUESTER? OR FIX?)  
 L44 340 SEA FILE=WPIX ABB=ON L37 AND L43  
 L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)  
 L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC  
 L52 0 SEA FILE=COMPENDEX ABB=ON L42 OR L47

=> file jicst

FILE 'JICST-EPLUS' ENTERED AT 09:57:33 ON 03 MAR 2004

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=> d que 153

L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR  
 DISPOS?)  
 L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?  
 L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37  
 L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)  
 L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC  
 L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR  
 SEQUESTER? OR FIX?)  
 L44 340 SEA FILE=WPIX ABB=ON L37 AND L43

L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)  
 L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC  
 L48 6 SEA FILE=WPIX ABB=ON L42 OR L47  
 L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?  
 L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC  
 L53 2 SEA FILE=JICST-EPLUS ABB=ON L48 OR L50

=> file japio

FILE 'JAPIO' ENTERED AT 09:57:48 ON 03 MAR 2004  
 COPYRIGHT (C) 2004 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 1 MAR 2004 <20040301/UP>  
 FILE COVERS APR 1973 TO OCTOBER 31, 2003

<<< GRAPHIC IMAGES AVAILABLE >>>

=> d que 154

L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR  
 DISPOS?)  
 L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?  
 L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37  
 L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)  
 L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC  
 L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR  
 SEQUESTER? OR FIX?)  
 L44 340 SEA FILE=WPIX ABB=ON L37 AND L43  
 L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)  
 L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ  
 OR AQUEOUS?)  
 L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC  
 L48 6 SEA FILE=WPIX ABB=ON L42 OR L47  
 L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?  
 L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC  
 L54 4 SEA FILE=JAPIO ABB=ON L48 OR L50

=> dup rem 135 151 152 153

L52 HAS NO ANSWERS

FILE 'HCAPLUS' ENTERED AT 09:58:11 ON 03 MAR 2004  
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 PROCESSING COMPLETED FOR L51  
 PROCESSING COMPLETED FOR L52  
 PROCESSING COMPLETED FOR L53  
 L55 54 DUP REM L35 L51 L52 L53 (1 DUPLICATE REMOVED)

=> d all 155 1-54

L55 ANSWER 1 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN  
 AN 2003-449241 [42] WPIX  
 DNC C2003-119246  
 TI Production of liquid **carbon dioxide** from combustion  
**gas** at normal pressure, involves transferring carbon dioxide from  
 the normal pressure combustion **gas** to a **carbon**  
**dioxide** concentrate at lower pressure and specified temperature.  
 DC E36 J01  
 IN NURMIA, M  
 PA (NURM-I) NURMIA M; (NURM-I) NURMIA W  
 CYC 101  
 PI WO 2003035221 A1 20030501 (200342)\* EN 21p B01D053-14 <--  
 RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU  
 MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW  
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK  
 DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR  
 KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT  
 RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA  
 ZM ZW  
 FI 2001005028 A 20030423 (200346) B01D053-14 <--  
 FI 111607 B1 20030829 (200364) B01D053-14 <--  
 ADT WO 2003035221 A1 WO 2002-FI814 20021021; FI 2001005028 A FI 2001-5028  
 20011022; FI 111607 B1 FI 2001-5028 20011022  
 FDT FI 111607 B1 Previous Publ. FI 2001005028  
 PRAI FI 2001-5028 20011022  
 IC ICM **B01D053-14**  
 ICS **B01D053-62**; C01B031-20  
 ICI B01D179:00  
 AB WO2003035221 A UPAB: 20030703  
 NOVELTY - Production of liquid **carbon dioxide** from  
 combustion **gas** at normal pressure involves transferring carbon  
 dioxide from the normal pressure combustion gas, using a nearly reversible  
 absorption and desorption process, to carbon dioxide concentrate at a  
 lower pressure and at 35-75 deg. C, such that absorption and desorption  
 take place at the same temperature without importing external heat to the  
 processes.  
 DETAILED DESCRIPTION - Production of liquid **carbon**  
**dioxide** from combustion **gas** at normal pressure involves  
 absorbing in an absorption solution that flows downwards from its upper  
 part, the **carbon dioxide (CO2)** of combustion  
**gas** led to the lower part of an absorption column (11); and  
**removing** the **CO2-poor combustion gas** from the  
 upper part of the absorption column. The absorption solution is led to the  
 upper part of a desorption column (12). The CO2 is desorbed from the  
 absorption solution led to the upper part of the desorption column to form  
 a **gaseous CO2** concentrate, which is **removed**  
 from the upper part as the absorption solution flows to the lower part of  
 the column, from which it is recirculated to the upper part of the  
 absorption column. The CO2 concentrate obtained is brought to a high  
 pressure, and most of the concentrate's CO2 is liquidized. The CO2 is  
 transferred from the normal-pressure combustion gas, using a nearly  
 reversible absorption and desorption process, to the CO2 concentrate at a  
 lower pressure and at a temperature near to that of the combustion gas  
 being processed, preferably at 35-75 deg. C, such that the absorption and  
 desorption processes take place at the same temperature, preferably

without importing external heat to the processes.

USE - Production of liquid **carbon dioxide** from combustion **gas** at normal pressure.

ADVANTAGE - The process allows more energy-economical separation of carbon dioxide, compared to the prior art.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic diagram of the process.

Absorption column 11

Desorption column 12

Liquidization column 18

Heat exchangers 19.1, 19.2, 19.3, 19.4

Cooling turbines 20.1, 20.2, 20.3

Cooling-expansion cycle 24

Dwg.1/2

FS

CPI

FA

AB; GI; DCN

MC

CPI: E31-N05C; J01-E03C

L55 ANSWER 2 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2003:627223 HCAPLUS

DN 139:353573

ED Entered STN: 15 Aug 2003

TI Ion Exchange Resins as Reversible Acid Gas Absorbents

AU Quinn, R.

CS Corporate Science and Technology Center, Air Products and Chemicals, Inc., Allentown, PA, 18195-1501, USA

SO Separation Science and Technology (2003), 38(14), 3385-3407

CODEN: SSTEDS; ISSN: 0149-6395

PB Marcel Dekker, Inc.

DT Journal

LA English

CC 59-4 (Air Pollution and Industrial Hygiene)

AB Strongly basic anion exchange resins containing quaternary ammonium functionality and fluoride or acetate anions were found to remove

**carbon dioxide** and hydrogen sulfide from **gas**

streams. The absorption/desorption isotherms, heats of absorption, and gas separation properties were determined for a series of such resins. The

fluoride

form of Amberlyst A-26, for example, absorbed CO<sub>2</sub> and H<sub>2</sub>S reversibly, 0.23 mol CO<sub>2</sub>/mol F<sup>-</sup> and 0.24 mol H<sub>2</sub>S/mol F<sup>-</sup> at 100 kPa and 22 and 30°C, resp. Absorption of CO<sub>2</sub> was fast compared to its desorption.

Characterization by NMR indicated that **bicarbonate** was formed by reaction of CO<sub>2</sub> with F<sup>-</sup> containing resins. Heats of CO<sub>2</sub> absorption by F<sup>-</sup> Amberlyst A-26 were pressure dependent and ranged from -5.0 to -3.2 kcal/mol CO<sub>2</sub> for pressures of 50 to 1000 kPa. The fluoride and acetate containing resins were effective for removal of **CO<sub>2</sub>** and H<sub>2</sub>S from

**gas** mixts. Passage of a **gas** mixture containing 1% **CO<sub>2</sub>**

or 5% H<sub>2</sub>S through a packed column of F<sup>-</sup> Amberlyst A-26 at 22°C

reduced the CO<sub>2</sub> or H<sub>2</sub>S concentration to less than 25 ppm. Regeneration of the absorbents was accomplished by purging with inert **gas** at

50°C. Removal of **CO<sub>2</sub>** from **gas** streams containing

substantial **water** vapor concns. was achieved using F<sup>-</sup> Amberlyst A-26 resin.

ST ion exchange resin reversible acid gas absorbent Amberlyst

IT **Waste gases**

(acidic; ion exchange resins as reversible acid gas absorbents)

IT Functional groups

(ammonio group; ion exchange resins as reversible acid gas absorbents)

IT Absorbents  
 Ion exchangers  
 (ion exchange resins as reversible acid gas absorbents)  
 IT 39339-85-0, Amberlyst A-26  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (fluoride and acetate containing; ion exchange resins as reversible acid gas absorbents)  
 IT 71-50-1, Acetate, uses 16984-48-8, Fluoride, uses  
 RL: MOA (Modifier or additive use); USES (Uses)  
 (ion exchange resins as reversible acid gas absorbents)  
 IT 37264-66-7, Amberlite ira910 39405-29-3, SP 2 53125-38-5, Dowex msal  
 59753-65-0, Diaion pa408  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (ion exchange resins as reversible acid gas absorbents)  
 IT 124-38-9, Carbon dioxide, processes  
 RL: PEP (Physical, engineering or chemical process); POL (Pollutant); PYP (Physical process); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)  
 (ion exchange resins as reversible acid gas absorbents)

RE.CNT 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

- (1) Albright, R; Encyclopedia of Polymer Science and Engineering 1987, V8, P341
- (2) Alovvainikov, A; Teor Prakt Sorbtsionnykh Protsessov 1980, V13, P99 HCAPLUS
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- (14) Quinn, R; US 4780114 1988 HCAPLUS
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- (16) Quinn, R; US 5336298 1994 HCAPLUS
- (17) Quinn, R; US 5797979 1998 HCAPLUS
- (18) Quinn, R; J Am Chem Soc 1995, V117, P329 HCAPLUS
- (19) Quinn, R; J Membr Sci 1995, V104, P139 HCAPLUS
- (20) Quinn, R; J Membr Sci 1997, V131, P49 HCAPLUS
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L55 ANSWER 3 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2002:204634 HCAPLUS

DN 136:236149

ED Entered STN: 19 Mar 2002

TI Chemical **fixation** of carbon dioxide as **carbonates** by using amine

IN Shibata, Shunji; Yamamoto, Hideki

PA Kansai University, Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese  
 IC ICM B01D053-14  
 ICS B01D053-14; B01D053-62; B01J019-00; C01B031-20  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002079035	A2	20020319	JP 2000-268184	20000905
PRAI	JP 2000-268184		20000905		

AB The **fixation** of CO2 is carried out by the following steps: (1) reacting amines with a salt-containing **H2O** phase while **CO2** in a **gas** phase is brought in contact with the **H2O** phase and (2) removing the resulting amine salts for producing **carbonates** by reaction between the remaining anions, which are originated from the salts in the **H2O** phase, and the dissolved CO2. In the step 1, the amines may be dissolved in an organic phase. After the **fixation**, the amine salts can be easily regenerated into amines by removing acids from the amine salts. **CO2 gas** is absorbed and **fixed** in high efficiency with low energy consumption, and the obtained **carbonates** can be used as industrial raw materials. The **fixation** method is useful for treating **waste gas** from chemical factories, power plants, etc.

ST chem **fixation** carbon dioxide **carbonate** amine salt;  
**waste gas carbon dioxide** removal  
 chem **fixation carbonate**

IT **Waste gases**  
 (high-efficient chemical **fixation** of **CO2** as  
**carbonates** by using amine and salt-containing **H2O** phase)

IT Amines, uses  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (high-efficient chemical **fixation** of CO2 as **carbonates**  
 by using amine and salt-containing **H2O** phase)

IT 144-55-8P, Sodium hydrogen **carbonate**, uses  
 RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
 (high-efficient chemical **fixation** of CO2 as **carbonates**  
 by using amine and salt-containing **H2O** phase)

IT 7647-14-5, Sodium chloride, uses  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (high-efficient chemical **fixation** of CO2 as **carbonates**  
 by using amine and salt-containing **H2O** phase)

IT **124-38-9**, Carbon oxide (**CO2**), reactions  
 RL: RCT (Reactant); **REM (Removal or disposal)**; PROC (Process);  
 RACT (Reactant or reagent)  
 (high-efficient chemical **fixation** of **CO2** as  
**carbonates** by using amine and salt-containing **H2O** phase)

L55 ANSWER 4 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-414605 [44] WPIX

DNC C2002-117057

TI Simultaneous reduction of carbon dioxide and sulfur dioxide emissions by injecting calcium-based agent into hearth, subjecting flue gases to intermediate cooling, carbonizing, and extracting solids contained in the flue gases.

DC J01 Q73

IN BEAL, C; MORIN, J; VANDYCKE, M; MORIN, J X

PA (ALSM) ALSTOM POWER NV; (ALSM) ALSTOM



CYC 27  
 PI US 2002037246 A1 20020328 (200244)\* 4p B01D053-50 <--  
 EP 1193444 A1 20020403 (200244) FR F23J007-00  
 R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT  
 RO SE SI TR  
 FR 2814533 A1 20020329 (200244) F23J007-00  
 ADT US 2002037246 A1 US 2001-951389 20010914; EP 1193444 A1 EP 2001-402311  
 20010906; FR 2814533 A1 FR 2000-12288 20000927  
 PRAI FR 2000-12288 20000927  
 IC ICM **B01D053-50**; F23J007-00  
 ICS **B01D053-14**; **B01D053-62**; B01J020-04; B01J020-34;  
 F23C010-00; F23J015-00  
 ICA F23G005-30; F23G005-46  
 AB US2002037246 A UPAB: 20020711  
 NOVELTY - Simultaneous reduction of carbon dioxide and sulfur dioxide  
 emissions involves injecting into a hearth a calcium-based agent;  
 subjecting the flue gases to intermediate cooling, causing them to transit  
 via a first reactor, and putting them in contact with the other fraction  
 of the absorbent that has not reacted with sulfur dioxide; and extracting  
 solids contained in the flue gases.  
 DETAILED DESCRIPTION - Simultaneous reduction of carbon dioxide (CO2)  
 and sulfur dioxide (SO2) emissions produced by the combustion of  
 carbon-containing matter in a hearth (1) involves injecting into the  
 hearth a calcium-based agent (2), a fraction of which absorbs SO2 after  
 decarbonization; subjecting the flue gases to intermediate cooling,  
 causing them to transit via a first reactor (4), and putting them in  
 contact with the other fraction of the absorbent that has not reacted with  
 SO2 to capture **CO2** from the flue **gases** by  
 carbonization; and in a separator (6), extracting the solids contained in  
 the flue gases output from the first reactor to subject them to heat  
 treatment in a second reactor (11) to **extract CO2** by  
 decarbonization and to recycle the resulting regenerated CO2 absorbent to  
 the first reactor.  
 USE - The method is used for simultaneously reducing carbon dioxide  
 and sulfur dioxide emissions produced by the combustion of  
 carbon-containing matter, e.g. fossil fuels or **waste**, in a  
 hearth.  
 ADVANTAGE - The inventive method provides effective desulfurization  
 of the flue gases.  
 DESCRIPTION OF DRAWING(S) - The figure shows the inventive method.  
 Hearth 1  
 Calcium-based agent 2  
 First reactor 4  
 Separator 6  
 Dust filter 9  
 Second reactor 11  
 Heat exchanger 18  
 Dwg.1/1  
 FS CPI GMPI  
 FA AB; GI  
 MC CPI: J01-E02B  
 L55 ANSWER 5 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 2001:693790 HCAPLUS  
 DN 135:261506  
 ED Entered STN: 21 Sep 2001  
 TI Method and apparatus for **extracting** and **sequestering**  
 carbon dioxide

*applicants*

IN Rau, Gregory H.; Caldeira, Kenneth G.  
 PA Rau, Gregory, USA  
 SO U.S. Pat. Appl. Publ., 23 pp., Cont.-in-part of U.S. Ser. No. 314,220,  
 abandoned.  
 CODEN: USXXCO  
 DT Patent  
 LA English  
 IC ICM B01D053-34  
 ICS B01J008-00  
 NCL 422169000  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)  
 Section cross-reference(s): 61  
 FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2001022952	A1	20010920	US 2001-759781	20010116
PRAI	US 1998-96846P	P	19980818		
	US 1999-314220	B2	19990519		

AB A method and apparatus to **extract** and **sequester** carbon dioxide (CO<sub>2</sub>) from a stream or volume of **gas** wherein said method and apparatus **hydrates** CO<sub>2</sub>, and reacts the resulting **carbonic** acid with **carbonate**. Suitable **carbonates** include, but are not limited to, **carbonates** of alkali metals and alkaline earth metals, preferably **carbonates** of calcium and magnesium. Waste products are metal cations and **bicarbonate** in solution or dehydrated metal salts, which when disposed of in a large body of **water** provide an effective way of **sequestering** CO<sub>2</sub> from a **gaseous** environment.

ST **carbon dioxide** removal **waste gas**  
**sequestering** seawater 4512367 7612345

IT **Bicarbonates**  
 RL: FMU (Formation, unclassified); **REM (Removal or disposal)**;  
 FORM (Formation, nonpreparative); PROC (Process)  
 (alkali metals and alkaline earth metals; method and apparatus for **extg**  
 . and **sequestering carbon dioxide** from  
**waste gases**)

IT **Carbonates**, uses  
 RL: NUU (Other use, unclassified); **USES (Uses)**  
 (alkali metals and alkaline earth metals; method and apparatus for **extg**  
 . and **sequestering carbon dioxide** from  
**waste gases**)

IT Carboxylic acids, uses  
 RL: NUU (Other use, unclassified); **USES (Uses)**  
 (aromatic; method and apparatus for **extracting** and **sequestering**  
**carbon dioxide** from **waste gases**)

IT Alkali metals, uses  
 Alkaline earth metals  
 RL: NUU (Other use, unclassified); **USES (Uses)**  
 (**carbonates**; method and apparatus for **extracting** and  
**sequestering carbon dioxide** from  
**waste gases**)

IT **Waste gases**  
 (method and apparatus for **extracting** and **sequestering**  
**carbon dioxide** from **waste gases**)

IT Humus  
 Metals, uses  
 RL: NUU (Other use, unclassified); **USES (Uses)**  
 (method and apparatus for **extracting** and **sequestering**

**carbon dioxide from waste gases)**  
IT Glycoproteins, general, uses  
RL: NUU (Other use, unclassified); USES (Uses)  
(succinate; method and apparatus for **extracting** and  
**sequestering carbon dioxide** from  
**waste gases)**  
IT 50-99-7, Dextrose, uses 56-40-6, Glycine, uses  
56-86-0, L-Glutamic acid, uses 59-23-4, Galactose, uses  
60-00-4, EDTA, uses 64-19-7, Acetic acid, uses  
74-79-3, Arginine, uses 77-92-9, uses 97-67-6  
107-35-7, Taurine 127-17-3, uses 471-34-1,  
Calcium **carbonate**, uses 546-93-0, Magnesium  
**carbonate** 556-50-3 9005-79-2, Glycogen, uses  
9007-28-7, Chondroitin sulfate 14265-44-2, Phosphate,  
uses 22537-22-0, Magnesium 2+, uses  
RL: NUU (Other use, unclassified); USES (Uses)  
(method and apparatus for **extracting** and **sequestering**  
**carbon dioxide** from **waste gases)**  
IT 124-38-9, **Carbon dioxide**, processes  
RL: REM (**Removal or disposal**); PROC (Process)  
(method and apparatus for **extracting** and **sequestering**  
**carbon dioxide** from **waste gases)**  
L55 ANSWER 6 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN  
AN 2001-138271 [14] WPIX  
DNC C2001-040771  
TI Solid sorbent composition useful for the **removal** of  
**carbon dioxide** and other acidic components is formed by  
the reaction of at least one liquid absorbent material with a hardener.  
DC E36 J01  
IN AFREMOV, L; BRANOVER, Y; LESIN, S; PIPKO, G; SINATOV, S  
PA (SOLM-N) SOLMECS ISRAEL LTD  
CYC 94  
PI WO 2001003827 A1 20010118 (200114)\* EN 17p B01J020-04  
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ  
NL OA PT SD SE SL SZ TZ UG ZW  
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM  
DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC  
LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SE SG  
SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW  
AU 2000055618 A 20010130 (200127) B01J020-04  
US 2002147109 A1 20021010 (200269) B01J020-22  
ADT WO 2001003827 A1 WO 2000-IL385 20000703; AU 2000055618 A AU 2000-55618  
20000703; US 2002147109 A1 US 2002-42387 20020111  
FDT AU 2000055618 A Based on WO 2001003827  
PRAI IL 1999-130882 19990711  
IC ICM B01J020-04; B01J020-22  
ICS **B01D053-62**; B01J020-06; B01J020-30  
AB WO 200103827 A UPAB: 20010312  
NOVELTY - A solid sorbent composition is formed by the reaction of at  
least one liquid absorbent material (1) with at least one hardener. (1) is  
capable of absorbing carbon dioxide and other acidic components.  
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for :  
(a) use of the composition for **removal** of **carbon**  
**dioxide** from a **gaseous** stream. The solid sorbent is  
introduced into the stream at a temperature lower than 80 deg. C  
(preferably 60 deg. C) and upon saturation of the sorbent with carbon  
dioxide, the solid sorbent is reheated above 85 deg. C (preferably 65 deg.

C) at which carbon dioxide is released, thus enabling the recycling of the solid sorbent for reintroduction into the gaseous stream; and  
 (b) preparation of the solid sorbent composition involving  
 (1) mixing at least one (1) with at least one hardener;  
 (2) heating the mixture of step (i) to 100 deg. C to effect a chemical reaction between the components of the mixture with the formation of a reaction product;  
 (3) processing the product of step (ii) into a granulated form; and  
 (4) drying the granulated sorbent.

USE - For the **removal** of **carbon dioxide** and other acidic components such as SO<sub>2</sub>, H<sub>2</sub>S, HCl, NO<sub>2</sub> from the gaseous stream (claimed).

ADVANTAGE - The composition utilizes inexpensive sorbent and simple equipment, involves possible recovery of low temperature **waste** heat for regeneration of sorbent, provides a higher chemical reaction rate, a higher adsorptive capability which allows the use of less sorbent material. The use of smaller amounts of the sorbents in addition to the narrow temperature range of the reversible chemical reaction allows for conservation of energy and the elimination of damaging effects to the sorbent in the presence of **water** vapor. The composition is environmental friendly.

Dwg.0/0

FS

CPI

FA

AB; DCN

MC

CPI: E10-B03B; E11-Q02; E31-B03D; E31-F01A; E31-F01B; E31-H02; E31-N05C; E33-A03; E33-D; E34; E34-B01; E34-C02; E35-C; J01-E02B

L55

ANSWER 7 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN

2001-243306 [25] WPIX

DNC

C2001-072913

TI

Removal of sulfur dioxide and **carbon dioxide** from **gases** coming from coal fired boilers involves contacting gases with **aqueous** solution of dimethyl sulfoxide.

DC

E36 J01

IN

KIRSCHNER, L

PA

(KIRS-I) KIRSCHNER L

CYC

1

PI

US 6187277 B1 20010213 (200125)\* 9p B01D053-50 <--

ADT

US 6187277 B1 US 1999-325955 19990604

PRAI

US 1999-325955 19990604

IC

ICM **B01D053-50**

AB

ICS **B01D053-62**

US 6187277 B UPAB: 20010508

NOVELTY - Sulfur dioxide (SO<sub>2</sub>) and **carbon dioxide** (CO<sub>2</sub>) are **removed** from a gas by dissolving SO<sub>2</sub> and CO<sub>2</sub> in an **aqueous** solution of dimethyl sulfoxide at a pH less than 7. The dissolved gases are reacted with alkaline earth metal ions, and the reaction products are separated from the solution.

DETAILED DESCRIPTION - **Removal** of SO<sub>2</sub> and (CO<sub>2</sub>) from a **gas** involves contacting the gas with an **aqueous** solution of dimethyl sulfoxide (DMSO) at a pH less than 7 to dissolve SO<sub>2</sub> and CO<sub>2</sub> in the DMSO solution, reacting the dissolved SO<sub>2</sub> and CO<sub>2</sub> with alkaline earth metal ions, and separating the reaction products from the DMSO solution. SO<sub>2</sub> reacts with the alkaline earth metal ions to form solid alkaline earth sulfate and/or alkaline earth sulfite, while CO<sub>2</sub> reacts to form solid alkaline earth **carbonate**.

USE - The method is used for clean air technologies. It is particularly useful for removing sulfur dioxide from stack gases coming

from fossil fuel fired boilers (e.g., coal fired boilers).

ADVANTAGE - The process results to an almost 100% removal of sulfur dioxide. Use of DMSO provides continuous CO2 fire retardant atmosphere, which add a significant safety factor to the process. DMSO can be recovered unchanged when required.

Dwg.0/2

FS CPI

FA AB; DCN

MC CPI: E10-A10A; E11-Q02; E31-F01A; E31-N05C; J01-E02

L55 ANSWER 8 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-309821 [33] WPIX

CR 2001-114323 [13]

DNN N2001-221816 DNC C2001-095852

TI Suppressed ion chromatography comprises reducing **carbonic** acid formed during mobile phase suppression, by **removing carbon dioxide**.

DC J04 S03

IN ANDERSON, J M; BENEDICT, B C; GURNER, Y; PHAM, H A; SAARI-HORDHAUS, R; SIMS, C W; SAARI-NORDHAUS, R

PA (ALLT-N) ALLTECH ASSOC INC

CYC 28

PI EP 1092977 A1 20010418 (200133)\* EN 24p G01N030-96

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT  
RO SE SI

AU 2000066490 A 20010426 (200134) B01D015-08

CA 2323287 A1 20010413 (200137) EN G01N030-96

JP 2001194353 A 20010719 (200145) 52p G01N030-02

ADT EP 1092977 A1 EP 2000-122480 20001013; AU 2000066490 A AU 2000-66490 20001013; CA 2323287 A1 CA 2000-2323287 20001013; JP 2001194353 A JP 2000-351939 20001013

PRAI US 1999-417231 19991013

IC ICM B01D015-08; G01N030-02; G01N030-96

ICS G01N030-14

AB EP 1092977 A UPAB: 20020924

NOVELTY - Suppressed ion chromatography comprises (a) chromatographically separating analyte ions in an **aqueous** mobile phase comprising a cation **carbonate/bicarbonate**, (b) suppressing the mobile phase to form dissolved **carbonic** acid and **carbon dioxide gas** in equilibrium; (c) reducing the amount of **carbonic** acid by **removing carbon dioxide**, and (d) detecting the separated analyte ions.

USE - For detecting analyte ions.

ADVANTAGE - The reduced amount of **carbonic** acid reduces background noise, which interferes with the detection of sample ions. The suppressed chromatography effluent can be converted back to its strongly ionized state, thus the mobile phase can be recycled and reused.

Dwg.0/14

FS CPI EPI

FA AB

MC CPI: J04-B01C

EPI: S03-E09C5

L55 ANSWER 9 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN

AN 1020072761 JICST-EPlus

TI Size Control of Basic Magnesium **Carbonate** Particles by Reactive Crystallization.

AU TSUGE HIDEKI; TAKAHASHI YUJI; FUJIWARA EIJI

CS Keio Univ., Fac. of Sci. and Technol.  
SO Nippon Kaisui Gakkaishi (Bulletin of the Society of Sea Water Science, Japan), (2001) vol. 55, no. 6, pp. 408-418. Journal Code: F0235A (Fig. 9, Tbl. 2, Ref. 4)  
CODEN: NKAGBU; ISSN: 0369-4550  
CY Japan  
DT Journal; Article  
LA Japanese  
STA New  
AB To utilize magnesium in seawater and **fix carbon dioxide** in exhausted **gases**, the direct carbonation method has been used to precipitate basic magnesium **carbonate** (BMC). BMC particles are used as a filler or anticaking agent for NaCl, which means it is necessary to control the size of BMC particles according to production needs. The aims of this study are to clarify the mechanism of reactive crystallization of BMC in the direct carbonation method, and to control the particle size of BMC. BMC particles were produced in a gas blowing stirred tank crystallizer through a reaction between carbon dioxide and a suspended **aqueous** solution of magnesium hydroxide. The particles obtained were analyzed by means of X-ray diffraction and photographs were taken with a scanning electron microscope. In this study, a mixture of spherical and tabular BMC particles was obtained. Agglomeration between particles was not observed very much during the growth of BMC. The particle size of BMC was influenced by the initial concentration and particle size of magnesium hydroxide, and the reaction temperature. By changing the initial concentration of magnesium hydroxide and the reaction temperature, it was possible to control the particle size of BMC to between 4-9Mm. (author abst.)  
CC XD02070T; YB02060D (66.065.5; 661.66)  
CT magnesium **carbonate**; magnesium hydroxide; suspension(disperse system); gas-liquid-solid reaction; crystallization; sea **water**; particle size(diameter); bubble column; basic salt; reaction control; hydrogen ion concentration; temperature dependence; concentration dependence; scanning electron microscope; X-ray diffraction; suspended solids; carbon dioxide  
BT **carbonate**(salt); carbon oxoate; oxoate; oxygen compound; oxygen group element compound; carbon compound; carbon group element compound; magnesium compound; alkaline earth metal compound; hydroxide; hydrogen compound; disperse system; heterogeneous reaction; chemical reaction; modification; **water**; diameter; length; geometric quantity; chemical equipment; equipment; salt; control; acidity; degree; concentration(ratio); dependence; electron microscope; microscope; X-ray scattering; electromagnetic wave scattering; scattering; diffraction; coherent scattering; matter; carbon oxide; oxide; chalcogenide  
ST reactive crystallization; suspended solid; grain size control; **carbonic** acid gas  
L55 ANSWER 10 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 1  
AN 2000:144792 HCAPLUS  
DN 132:184778  
ED Entered STN: 03 Mar 2000  
TI Method and apparatus for extracting and sequestering carbon dioxide  
IN Rau, Gregory Hudson; Caldeira, Kenneth George  
PA United States Department of Energy, USA  
SO PCT Int. Appl., 36 pp.  
CODEN: PIXXD2  
DT Patent  
LA English

IC ICM B01D053-62

CC 59-4 (Air Pollution and Industrial Hygiene)

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000010691	A1	20000302	WO 1999-US18711	19990818
	W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	AU 9955680	A1	20000314	AU 1999-55680	19990818
PRAI	US 1998-96846P	P	19980818		
	US 1999-314220	A	19990519		
	WO 1999-US18711	W	19990818		
AB	A method and apparatus to extract and sequester <b>carbon dioxide</b> from a stream or volume of <b>gas</b> wherein said method and apparatus <b>hydrates CO2</b> , and reacts the resulting <b>carbonic acid</b> with <b>carbonate</b> . Suitable <b>carbonates</b> include, but are not limited to, <b>carbonates</b> of alkali metals and alkaline earth metals, preferably <b>carbonates</b> of calcium and magnesium. Waste products are metal cations and <b>bicarbonate</b> in solution, providing an effective way of sequestering <b>CO2</b> from a <b>gaseous</b> environment.				
ST	<b>carbon dioxide</b> removal <b>gas</b> sequestration				
IT	Limestone, uses				
	RL: MSC (Miscellaneous); NUU (Other use, unclassified); USES (Uses) (decarbonation; method and apparatus for extracting and sequestering <b>carbon dioxide</b> from <b>gases</b> )				
IT	Cement (construction material)				
	Flue gases				
	Waste gases				
	(method and apparatus for extracting and sequestering <b>carbon dioxide</b> from <b>gases</b> )				
IT	Lime (chemical)				
	RL: MSC (Miscellaneous)				
	(method and apparatus for extracting and sequestering <b>carbon dioxide</b> from <b>gases</b> )				
IT	60-00-4, EDTA, uses 471-34-1, Calcium <b>Carbonate</b> , uses 546-93-0, Magnesium <b>Carbonate</b> 13397-24-5, Gypsum, uses 13397-26-7, Calcite, uses 14791-73-2, Aragonite 16389-88-1, Dolomite, uses				
	RL: NUU (Other use, unclassified); USES (Uses)				
	(method and apparatus for extracting and sequestering <b>carbon dioxide</b> from <b>gases</b> )				
IT	124-38-9, Carbon dioxide, processes				
	RL: REM (Removal or disposal); PROC (Process)				
	(method and apparatus for extracting and sequestering <b>carbon dioxide</b> from <b>gases</b> )				
RE.CNT	10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD				
RE					
	(1) Berthold, K; US 3988422 A 1976 HCAPLUS				
	(2) Frevel, L; US 3660023 A 1972 HCAPLUS				
	(3) Fuchs, W; US 3511595 A 1970 HCAPLUS				
	(4) Hitachi Ltd; EP 0487102 A 1992 HCAPLUS				

- (5) Imperial Chemical; GB 1305718 A 1973 HCAPLUS
- (6) Metallgesellschaft; GB 819215 A 1959 HCAPLUS
- (7) Rimpi, P; US 4187279 A 1980 HCAPLUS
- (8) Sears, J; US 4510124 A 1985 HCAPLUS
- (9) Stewart, R; GB 2284203 A 1995
- (10) Wilson, H; US 5584905 A 1996 HCAPLUS

L55 ANSWER 11 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:339533 HCAPLUS

DN 132:338646

ED Entered STN: 23 May 2000

TI Method for **fixation** of dioxide carbon in **waste gases** or polluted air

IN Watanabe, Miki; Maenami, Hiroki; Shin, Hirohito; Hisano, Hiroaki; Nishino, Tadashi

PA Inax Corp., Japan; Foundation for Scientific Technology Promotion

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01J039-04

ICS B01J019-00; B01J049-00; C01B031-20; C01F011-18

CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000140651	A2	20000523	JP 1998-316398	19981106
PRAI	JP 1998-316398		19981106		

AB The title method comprises adding a waste mortar powder containing alkaline earth

metal ions (especially, Ca<sup>2+</sup>) io into a 1st reaction solution mainly containing **water** in the presence of cation-exchange resin to adsorb alkaline earth metal ions from the waste mortar powder, regenerating the spent cation exchange resin in a 2nd reaction solution mainly containing **water** at controlled pH  $\geq 10$  for separating and **extracting** the alkaline earth metal ions, and then bubbling of the 2nd reaction solution with **CO2** from **waste gases** or air to form alkaline earth metal **carbonates** (especially, CaCO<sub>3</sub>). The 2nd reaction solution may contain  $\geq 1$  alkali compds. such as NH<sub>4</sub>OH, NaOH, diethylamine, diethylenetriamine, ethylenediamine, and/or trimethanolamine.

ST **fixation** dioxide carbon air ion exchange pptn; **waste gas carbon dioxide fixation** cation exchange

IT Air purification

(**fixation** of dioxide carbon in polluted air by ion exchange and precipitation)

IT **Waste gases**

(**fixation** of dioxide carbon in **waste gases** by ion exchange and precipitation)

IT 107-15-3, Ethylenediamine, processes 109-89-7, Diethylamine, processes 111-40-0, Diethylenetriamine 1310-73-2, Sodium hydroxide, processes 1336-21-6, Ammonium hydroxide 14002-32-5, Trimethanolamine

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(alkali agent; in **fixation** of dioxide carbon in **waste gases** or polluted air by ion exchange and precipitation)

IT 54693-44-6, Diaion SK

RL: PEP (Physical, engineering or chemical process); TEM (Technical or



engineered material use); PROC (Process); USES (Uses)  
(**fixation** of dioxide carbon in polluted air by ion exchange  
and precipitation)

- IT **471-34-1P**, Calcium **carbonate**, preparation  
RL: BYP (Byproduct); PUR (Purification or recovery); PREP (Preparation)  
(method for **fixation** of dioxide carbon in **waste**  
**gases** or polluted air by ion exchange and precipitation)
- IT **124-38-9**, **Carbon dioxide**, processes  
RL: POL (Pollutant); **REM (Removal or disposal)**; OCCU  
(Occurrence); PROC (Process)  
(method for **fixation** of dioxide carbon in **waste**  
**gases** or polluted air by ion exchange and precipitation)

L55 ANSWER 12 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:37706 HCAPLUS

DN 132:82758

ED Entered STN: 18 Jan 2000

TI Porous agents for **waste gas** treatment and their  
manufacture

IN Kashiwagi, Yoshiyuki; Ishigaki, Haruhisa; Yoshioka, Nobuyuki

PA Meidensha Electric Mfg. Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-68

ICS B01J020-04

CC 59-4 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000015055	A2	20000118	JP 1998-183530	19980630
PRAI	JP 1998-183530		19980630		

AB The title agent consists of alkaline substances containing gasifying  
components,  
which are separated by heating to increase the sp. surface of the agent. The  
**gasifying** component may give **CO2** and **H2O**. The  
alkaline substance may contain alkali metal compds. such as **NaHCO3**, **Na**  
**sesquicarbonate**, and/or **KHCO3**. The agent is manufactured by heating the  
gasifying component-containing alkaline substance above, preferably with  
indirect  
heating, elec. heating, and/or microwave heating. The agent is useful for  
prevention of generation of dioxins and Cl gases from incinerator flue  
gases.

ST alkali metal heating flue gas treatment

IT Electric heating

Heating

Microwave heating

(heating in manufacture of **gasifying CO2-** and

**H2O**-containing porous alkaline substance for generation prevention of  
**HCl** and dioxin from incinerator flue gas)

IT Alkali metal compounds

RL: PRP (Properties); TEM (Technical or engineered material use); USES  
(Uses)

(heating in manufacture of **gasifying CO2-** and

**H2O**-containing porous alkaline substance for generation prevention of  
**HCl** and dioxin from incinerator flue gas)

IT Flue **gases**

(incinerator; heating in manufacture of **gasifying CO2-** and **H2O**-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT 262-12-4D, Dibenzob[b,e][1,4]dioxin, chloro derivs.  
 RL: **REM (Removal or disposal)**; PROC (Process)  
 (PCDD; heating in manufacture of **gasifying CO2-** and **H2O**-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT 124-38-9, **Carbon dioxide**, processes 7732-18-5, **Water**, processes  
 RL: PEP (Physical, engineering or chemical process); PROC (Process)  
 (heating in manufacture of **gasifying CO2-** and **H2O**-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT 144-55-8, Sodium **bicarbonate**, uses 298-14-6, Potassium **bicarbonate** 533-96-0, Sodium sesquicarbonate  
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)  
 (heating in manufacture of **gasifying CO2-** and **H2O**-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT 132-64-9D, Dibenzofuran, chloro derivs. 1746-01-6, TCDD 7647-01-0, Hydrogen chloride, processes  
 RL: **REM (Removal or disposal)**; PROC (Process)  
 (heating in manufacture of **gasifying CO2-** and **H2O**-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

L55 ANSWER 13 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1999:633377 HCAPLUS  
 DN 131:247591  
 ED Entered STN: 06 Oct 1999  
 TI Method and apparatus for refining **waste gas** for recovering fuel  
 IN Nakamura, Takeshi; Tanjo, Tetsuo; Kasai, Takeshi  
 PA Kyoritsu K. K., Japan; Sankyo Process Service K. K.  
 SO Jpn. Kokai Tokkyo Koho, 9 pp.  
 CODEN: JKXXAF  
 DT Patent  
 LA Japanese  
 IC ICM B01D053-52  
 ICS B01D053-58; B01D053-04; B01D053-14; B01D053-68; B01D053-77  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)  
 Section cross-reference(s): 52, 60

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 11267450	A2	19991005	JP 1998-78082	19980325
PRAI	JP 1998-78082		19980325		

AB A **waste gas** containing a fuel **gas** such as CH4 together with **CO2** and impurities such as HS, HCl, cyanide gas, NH3, etc. is successively treated with an **aqueous** solution containing amines, an **aqueous** solution containing alkali **carbonates** and alkali hydrogen **carbonates**, and an **aqueous** solution containing phenols, xenols, or amino acids at pH ≤9.0 of resp. solns. to selectively adsorb and remove the impurities and to suppress the impurities to resp. prescribed concentration levels. The apparatus for the method

comprises an absorption tower, treatment solution supplying means for sep. supplying resp. solns., and recovering and treating means for recovering and treating the resp. solns. to make the solns. repeatedly usable. The absorption tower is a counterflow type. The method and the apparatus are for recovering a pure fuel **gas** from **waste gases** from coke-fueled furnaces, industrial plants, bioreactor fermentation tanks,

and

the likes.

ST refuse derived fuel purify impurity absorption; combustion gas methane recovery recycling fuel

IT Amines, processes

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)  
(acidic impurity gas removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Phenols, processes

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)  
(ammonia removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Bioreactors

(biogas from; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Fuel **gases**

(biogas, as **waste gases**; methane-based fuel **gas** recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Alkali metal compounds

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)  
(**carbonates** and hydrogen **carbonates**, cyanides and acidic gas removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Furnaces

(coke-fueled, combustion gas from; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT pH

(control of, in **waste gas** treatment; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Refuse derived fuels

(methane as; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Combustion gases

(methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Fermentation

(of refuse, **waste gas** from; methane-based fuel gas recovery from combustion **gases** and **waste**

- gases** by removing impurity **gases** by absorption solns.)
- IT Recycling  
(of **waste gases** as fuel **gas**;  
methane-based fuel gas recovery from combustion **gases** and  
**waste gases** by removing impurity **gases** by  
absorption solns.)
- IT Cyanides (inorganic), processes  
RL: PEP (Physical, engineering or chemical process); POL (Pollutant); REM  
(Removal or disposal); OCCU (Occurrence); PROC (Process)  
(removal of; methane-based fuel gas recovery from combustion  
**gases** and **waste gases** by removing impurity  
**gases** by absorption solns.)
- IT 108-95-2, Phenol, processes 1322-20-9, Phenylphenol  
RL: PEP (Physical, engineering or chemical process); TEM (Technical or  
engineered material use); PROC (Process); USES (Uses)  
(ammonia removal by; methane-based fuel gas recovery from combustion  
**gases** and **waste gases** by removing impurity  
**gases** by absorption solns.)
- IT 74-82-8P, Methane, preparation  
RL: PUR (Purification or recovery); PREP (Preparation)  
(methane-based fuel gas recovery from combustion **gases** and  
**waste gases** by removing impurity **gases** by  
absorption solns.)
- IT 124-38-9, Carbon dioxide, processes  
7647-01-0, Hydrochloric acid, processes 7664-41-7, Ammonia, processes  
7783-06-4, Hydrogen sulfide, processes  
RL: PEP (Physical, engineering or chemical process); POL (Pollutant);  
**REM (Removal or disposal)**; OCCU (Occurrence); PROC (Process)  
(removal of; methane-based fuel **gas** recovery from combustion  
**gases** and **waste gases** by removing impurity  
**gases** by absorption solns.)

L55 ANSWER 14 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 2000:425468 HCAPLUS  
DN 133:21611  
ED Entered STN: 26 Jun 2000  
TI Decarbonization, desulfurization, and decyanation catalytic process for  
industrial **waste gas** using Fe-alkali solution  
IN Wei, Xionghui; Zou, Meihua; Wei, Fenghui  
PA Peop. Rep. China  
SO Faming Zhuanli Shenqing Gongkai Shuomingshu, 17 pp.  
CODEN: CNXXEV  
DT Patent  
LA Chinese  
IC ICM B01D053-79  
ICS B01D053-90; B01D053-46  
CC 59-5 (**Air Pollution** and Industrial Hygiene)  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	CN 1227135	A	19990901	CN 1999-100596	19990205
	CN 1092994	B	20021023		
PRAI	CN 1999-100596		19990205		
AB	S, HCN, and <b>CO2</b> are removed from industrial <b>waste gas</b> by using Fe-alkali solution, and the Fe-alkali solution is regenerated by oxidizing with O2 and treating with NaOH. The Fe-alkali solution is prepared from Fe compound, Na2CO3, hydroquinone, and <b>water</b> .				

The **waste gas** is treated with the above solution at 30-90° and 1.0-5.0 MPa, and the solution is regenerated at 90-130° and 0.05-0.3 MPa when the **waste gas** contains 20 .ltoreq.CO2.ltoreq.100, S≤0.07, and HCN≤0.001 vol%; the solution (pH 3-11.5) contains Na+ ≤6.0, Fe ion ≤0.5, and hydroquinone ≤0.15M. The **waste gas** is treated at 30-60° and 0.3-2.0 MPa, and the solution is regenerated at 35-120° when the **waste gas** contains 10.ltoreq.CO2.ltoreq.20, S≤0.1, and HCN≤0.04 vol%; the solution (pH 3-12) contains Na+ ≤2.5, Fe ion ≤1.0, and hydroquinone ≤0.25M. The **waste gas** is treated at 30-60°, and the solution is regenerated at 35-80° when the **waste gas** contains CO2 ≤10, S≤0.1, and HCN≤0.04 vol%; the solution (pH 4-12) contains Na+ ≤1.5, Fe ion ≤2.1, and hydroquinone ≤0.25M. Na2CO3 can be substituted by K2CO3, Na3PO4, K3PO4, Na3BO3, K3BO3, Na3AsO4, K3AsO4, or alc. amine. Hydroquinone can be substituted by tanning **extract**

- ST **waste gas** decarbonization iron alkali soln;  
desulfurization **waste gas** iron alkali soln;  
decyanation **waste gas** iron alkali soln
- IT Decarbonization  
Desulfurization  
(industrial **waste gas** treatment using Fe-alkali solution)
- IT Tanning materials (curing)  
(industrial **waste gas** treatment using Fe-alkali solution containing)
- IT **Waste gases**  
(industrial; industrial **waste gas** treatment using Fe-alkali solution)
- IT Cyanation  
(retro; industrial **waste gas** treatment using Fe-alkali solution)
- IT 74-90-8, Hydrogen cyanide, processes 124-38-9, Carbon dioxide, processes 7704-34-9, Sulfur, processes RL: REM (Removal or disposal); PROC (Process)  
(industrial **waste gas** treatment using Fe-alkali solution)
- IT 123-31-9, 1,4-Benzenediol, uses 497-19-8, Sodium carbonate, uses 584-08-7, Potassium carbonate 7439-89-6, Iron, uses 7601-54-9, Sodium phosphate 7631-89-2, Sodium arsenate 7778-53-2, Potassium phosphate 14312-40-4, Sodium borate Na3BO3 21581-60-2, Potassium borate K3BO3 76080-77-8, Potassium arsenate  
RL: TEM (Technical or engineered material use); USES (Uses)  
(industrial **waste gas** treatment using Fe-alkali solution containing)

L55 ANSWER 15 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1998:394380 HCAPLUS  
DN 129:19142  
ED Entered STN: 27 Jun 1998  
TI Apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide  
IN Yen, Chin-Ching; Lee, Chih-Ming  
PA Yen, Chin-Ching, Australia; Lee, Chih-Ming  
SO Pat. Specif. (Petty) (Aust.), 19 pp.

CODEN: AUXXDN  
DT Patent  
LA English  
IC ICM B01D053-14  
CC 59-4 (Air Pollution and Industrial Hygiene)  
FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	AU 685374	B3	19980115	AU 1996-74229	19961209
	US 5770167	A	19980623	US 1996-761001	19961205
PRAI	US 1996-761001	A	19961205		
AB	This invention relates to a <b>waste gas</b> treating apparatus, especially for treating a <b>waste gas</b> containing sulfur dioxide and <b>carbon dioxide</b> . It includes $\geq 1$ washing tower, in which $\geq 1$ fluid inlet is disposed on a lateral wall of the washing tower, so that a fluid is pumped into the washing tower by constant amount and drained out from a draining opening of a base of the washing tower; $\geq 1$ gas inlet is disposed on the wall of the washing tower below the fluid inlet. The <b>waste gas</b> is injected into the washing tower so as to contact with the fluid and form bubbles which buoy upward to a top of the washing tower and are exhausted from a gas outlet. The fluid serves to react with and absorb the pollutants contained in the <b>waste gas</b> . The products of the reaction are discharged out of the washing tower along with the fluid.				
ST	<b>waste gas</b> treatment app; <b>carbon dioxide</b> removal <b>waste gas</b> treatment; sulfur dioxide removal <b>waste gas</b> treatment				
IT	<b>Waste gases</b> (apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	Air pollution (control; apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	Lime (chemical) RL: NUU (Other use, unclassified); USES (Uses) (plasma; apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	7446-09-5, Sulfur dioxide, occurrence RL: POL (Pollutant); OCCU (Occurrence) (air pollution; apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	124-04-9, Adipic acid, uses RL: MOA (Modifier or additive use); USES (Uses) (apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	471-34-1, Calcium carbonate, uses RL: NUU (Other use, unclassified); USES (Uses) (apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	124-38-9, Carbon dioxide, processes 7446-09-5, Sulfur dioxide, processes RL: POL (Pollutant); REM (Removal or disposal); OCCU (Occurrence); PROC (Process) (apparatus for treating <b>waste gas</b> containing <b>carbon dioxide</b> and sulfur dioxide)				
IT	124-38-9, Carbon dioxide, occurrence RL: POL (Pollutant); OCCU (Occurrence) (pollution; apparatus for treating <b>waste gas</b> containing				

**carbon dioxide and sulfur dioxide)**

L55 ANSWER 16 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN  
AN 1999-045555 [04] WPIX  
DNC C1999-014385  
TI Use of **carbonic** anhydrase to remove carbon di oxide from gas  
mixture - to produce bi **carbonate** ion solution from carbon di  
oxide, carbon di oxide from the solution, or to purify carbon di oxide.  
DC D16 E36 J01  
IN BLAIS, R; ROGERS, P A; ROGERS, P  
PA (SYST-N) SYSTEMES ENVIROBIO INC; (COTW-N) CO2 SOLUTION INC  
CYC 83  
PI WO 9855210 A1 19981210 (199904)\* EN 20p B01D053-62  
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL  
OA PT SD SE SZ UG ZW  
W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE  
GH GM GW HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG  
MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG  
US UZ VN YU ZW  
AU 9877533 A 19981221 (199919) B01D053-62  
EP 991462 A1 20000412 (200023) EN B01D053-62  
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE  
JP 2002508702 W 20020319 (200222) 32p B01J019-00  
US 6524843 B1 20030225 (200323) A61L009-01  
EP 991462 B1 20030423 (200329) EN B01D053-62  
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE  
DE 69813811 E 20030528 (200343) B01D053-62  
ADT WO 9855210 A1 WO 1998-CA541 19980602; AU 9877533 A AU 1998-77533 19980602;  
EP 991462 A1 EP 1998-925349 19980602, WO 1998-CA541 19980602; JP  
2002508702 W WO 1998-CA541 19980602, JP 1999-501180 19980602; US 6524843  
B1 WO 1998-CA541 19980602, US 1999-424852 19991206; EP 991462 B1 EP  
1998-925349 19980602, WO 1998-CA541 19980602; DE 69813811 E DE 1998-613811  
19980602, EP 1998-925349 19980602, WO 1998-CA541 19980602  
FDT AU 9877533 A Based on WO 9855210; EP 991462 A1 Based on WO 9855210; JP  
2002508702 W Based on WO 9855210; US 6524843 B1 Based on WO 9855210; EP  
991462 B1 Based on WO 9855210; DE 69813811 E Based on EP 991462, Based on  
WO 9855210  
PRAI GB 1997-11439 19970604  
IC ICM A61L009-01; B01D053-62; B01J019-00  
ICS B01D047-00; B01D053-84; B01J008-04; C01B031-20; C12M001-40  
AB WO 9855210 A UPAB: 19990224

**Carbonic** anhydrase or an analog thereof immobilised in a  
bioreactor is used for: (A) **removing carbon**  
**dioxide** from a **CO2**-containing **gas**; (B)  
producing enriched solutions of hydrogen and **bicarbonate** ions  
from a **CO2**-containing **gas**; or (C) producing  
**CO2** from enriched solutions of hydrogen and **bicarbonate**  
ions.

Also claimed is apparatus comprising a bioreactor for processes  
(A)+(B) (which are effectively the same process), optionally with a second  
bioreactor for process (C), and/or a further reactor comprising an ion  
exchanger for a process (D), in which **bicarbonate** ions the  
enriched solution from step (A/B) are exchanged with hydroxyl ions from  
the ion exchanger, and then combine with hydrogen ions to form  
**water**.

USE - **Carbonic** anhydrase is used to effect the reversible  
**hydration** of **CO2** for **removal** of **CO2**  
from **gases**, for the purification of **CO2**, and/or for production

of hydrogen ions and **bicarbonate** ions. Useful in spacecraft applications.

Dwg.1/2

FS CPI

FA AB; GI; DCN

MC CPI: D05-A01B4; E11-Q01; E11-Q02; E31-A02; E31-N05C; J01-E02

L55 ANSWER 17 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1998-348293 [30] WPIX

DNC C1998-107659

TI Continuous removal of carbon di oxide from process gas - where the process solution is regenerated by removing organic acid potassium salts while retaining potassium vanadate and other constituents.

DC E36 J01 M14

IN HESSE, H J F; DU TOIT, F J; HESSE, H J F A; SMIT, M J; HESS, H J F A

PA (SASO-N) SASOL CHEM EURO LTD; (SASO-N) SASOL TECHNOLOGY PTY LTD

CYC 84

PI WO 9825688 A1 19980618 (199830)\* EN 21p B01D053-62 <--

RW: AT BE CH DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL OA

PT SD SE SZ UG ZW

W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE

GH GM GW HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG

MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG

US UZ VN YU ZW

ZA 9710745 A 19980826 (199840) 20p B01D000-00

AU 9878454 A 19980703 (199847) B01D053-62 <--

NO 9902856 A 19990811 (199943) B01D000-00

EP 948390 A1 19991013 (199947) EN B01D053-62 <--

R: AL AT BE CH DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO

SE SI

AU 716350 B 20000224 (200020) B01D053-62 <--

BR 9713928 A 20000321 (200028) B01D053-62 <--

EP 948390 B1 20010314 (200116) EN B01D053-62 <--

R: AL AT BE CH DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO

SE SI

MX 9904916 A1 20000401 (200124) B01D053-62 <--

DE 69704284 E 20010419 (200129) B01D053-62 <--

KR 2000069372 A 20001125 (200130) B01D053-62 <--

ES 2156638 T3 20010701 (200141) B01D053-62 <--

US 6312655 B1 20011106 (200170) B01D053-62 <--

MX 204306 B 20010917 (200239) B01D053-14 <--

PH 1199758797 B1 20020822 (200413) B01D053-62 <--

ADT WO 9825688 A1 WO 1997-GB3431 19971212; ZA 9710745 A ZA 1997-10745 19971128; AU 9878454 A AU 1998-78454 19971212; NO 9902856 A WO 1997-GB3431 19971212, NO 1999-2856 19990611; EP 948390 A1 EP 1997-949044 19971212, WO 1997-GB3431 19971212; AU 716350 B AU 1998-78454 19971212; BR 9713928 A BR 1997-13928 19971212, WO 1997-GB3431 19971212; EP 948390 B1 EP 1997-949044 19971212, WO 1997-GB3431 19971212; MX 9904916 A1 MX 1999-4916 19990527; DE 69704284 E DE 1997-604284 19971212, EP 1997-949044 19971212, WO 1997-GB3431 19971212; KR 2000069372 A WO 1997-GB3431 19971212, KR 1999-705096 19990608; ES 2156638 T3 EP 1997-949044 19971212; US 6312655 B1 WO 1997-GB3431 19971212, US 1999-297891 19990713; MX 204306 B MX 1999-4916 19990527; PH 1199758797 B1 PH 1997-58797 19971212

FDT AU 9878454 A Based on WO 9825688; EP 948390 A1 Based on WO 9825688; AU 716350 B Previous Publ. AU 9878454, Based on WO 9825688; BR 9713928 A Based on WO 9825688; EP 948390 B1 Based on WO 9825688; DE 69704284 E Based on EP 948390, Based on WO 9825688; KR 2000069372 A Based on WO 9825688; ES 2156638 T3 Based on EP 948390; US 6312655 B1 Based on WO 9825688



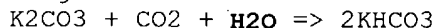
PRAI ZA 1996-10473 19961212

IC ICM B01D000-00; **B01D053-14**; **B01D053-62**

ICS **B01D053-96**; C02F000-00; C10K000-00; C23F011-06

AB WO 9825688 A UPAB: 19991122

Continuous **removal** of **carbon dioxide** from process **gas** by contacting the process gas under pressure in an absorption stage with an **aqueous** solution having dissolved therein potassium **carbonate** reagent, potassium **bicarbonate** reaction product, diethanol amine catalyst and potassium vanadate corrosion inhibitor, the carbon dioxide being absorbed by the solution and reacting therein with the potassium **carbonate** according to the reaction:



followed by an increase in the solution temperature and a decrease in the pressure exerted thereon to cause desorption, in a separate desorption stage, of the carbon dioxide from the solution according to the reverse reaction:



The **aqueous** solution is continuously recycled from the desorption stage to the absorption stage for further **removal** of **carbon dioxide** from process **gas**, the **aqueous** solution containing organic acids dissolved therein in the form of potassium salts.

The **removal** of **carbon dioxide** from the process **gas** is associated with a continuous increase in the organic acid concentration in solution.

The method comprises withdrawing as a side stream part of the **aqueous** solution, diluting the side stream with an **aqueous** diluent, and passing the side stream over a semipermeable membrane across which there is a pressure drop, to cause an **aqueous** solution of organic acid potassium salts to pass through the membrane, the remainder of the side stream being returned to the circuit.

The membrane and pressure drop are selected such that vanadate anions are essentially prevented from passing through the membrane and acceptably small proportions of potassium **carbonate**, potassium **bicarbonate** and diethanolamine pass through the membrane, the potassium **carbonate** and diethanolamine being added to the circuit as required to maintain their concentration in the **aqueous** solution.

Also claimed is treatment of an **aqueous** solution having dissolved therein potassium **carbonate**, potassium **bicarbonate**, diethanolamine, potassium vanadate and organic acid potassium salts, to remove the organic salts while retaining the potassium vanadate in the solution.

USE - The process is particularly useful in treatment of Benfield solutions or other process solutions containing potassium **carbonate**, potassium **bicarbonate**, diethanol amine and potassium vanadate and, as impurities, organic acid potassium salts, of the type used for **removing carbon dioxide** from process **gas** streams.

ADVANTAGE - The process avoids the discharge to **waste** of spent benfield solution by allowing its regeneration by removal of acid salts while substantially all the poisonous vanadate ions are retained in solution together with most of the potassium **carbonate**, potassium **bicarbonate** and diethanol amine. The pressure already existing in the carbon dioxide scrubbing units of the absorption stage can be used indirectly to provide a pressure drop across the semi-permeable membrane.

Dwg.0/1  
FS CPI  
FA AB; DCN  
MC CPI: E11-Q02; E31-N05C; J01-C03; J01-E02A; M14-K

L55 ANSWER 18 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1998:301873 HCAPLUS  
DN 128:298686  
ED Entered STN: 23 May 1998  
TI Absorption of carbon dioxide by lime **water** spray  
AU Taniguchi, Izumi; Yokoyama, Hiroki; Asano, Koichi  
CS Dep. Chem. Eng., Fac. Eng., Tokyo Inst. Technol., Tokyo, 152-8552, Japan  
SO Sekiyu Gakkaishi (1998), 41(3), 227-231  
CODEN: SKGSAE; ISSN: 0582-4664  
PB Sekiyu Gakkai  
DT Journal  
LA Japanese  
CC 59-4 (**Air Pollution** and Industrial Hygiene)  
AB Exptl. studies of **gas** absorption were carried out for  
**carbon dioxide**-air-**aqueous** Ca(OH)<sub>2</sub> solution system  
using a small spray column over a wide range of mass flow rates of liquid L  
= 3-8 + 10<sup>-3</sup> kg/s, mass flow rates of carbon dioxide-air mixts. G =  
0.5-2.0 + 10<sup>-3</sup> kg/s, and feed gas concns. y = 0.1-1.0. Observed data  
for the dimensionless rate of absorption of carbon dioxide showed good  
agreement with the one predicted by a solid sphere penetration model with  
second order irreversible chemical reaction for feed gas concentration y ≤  
0.2. The systematic deviation from the predicted one became considerable  
with increasing feed gas concentration and Fourier number This may be due to  
the formation of calcium **carbonate** precipitate near the gas-liquid interface  
of the spray drops.  
ST carbon dioxide wet scrubbing lime; absorption carbon dioxide calcium  
hydroxide soln  
IT **Waste gases**  
Wet scrubbing  
(absorption of **carbon dioxide** by lime **water**  
spray)  
IT 1305-62-0, Calcium hydroxide, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(absorption of carbon dioxide by lime **water** spray)  
IT **124-38-9, Carbon dioxide**, processes  
RL: **REM (Removal or disposal)**; PROC (Process)  
(absorption of **carbon dioxide** by lime **water**  
spray)

L55 ANSWER 19 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN  
AN 1997-187312 [17] WPIX  
DNC C1997-059773  
TI Recovering carbon di oxide gas from **waste** acid treatment bath -  
by neutralising acid(s) to **carbonate**(s), condensing gas by amine  
absorption or PSA and liquidising.  
DC E36 J01 M14  
PA (YAWA) NIPPON STEEL CORP  
CYC 1  
PI JP 09047634 A 19970218 (199717)\* 3p B01D053-62 <--  
ADT JP 09047634 A JP 1995-219529 19950804  
PRAI JP 1995-219529 19950804  
IC ICM **B01D053-62**

ICS **B01D053-04**; C01B013-02; C01B031-20  
 AB JP 09047634 A UPAB: 19970424

**Water** and acid mist in the gas (A) generated from a **waste acid bath** (B) are **removed**, then **CO2** in the **gas** is condensed by treating by amine absorption or PSA, and liquified. **Waste acids** are neutralised by adding them to **carbonates**. Alternatively (A) is drawn by blower from (B), then the concentration of **CO2** in (A) is increased by injecting it into (B), then recovering again.

USE - Used for recovering **CO2 gas** generated from **waste acid treatment baths**.

ADVANTAGE - Recovery of **CO2** which has been discharged into the environment is enabled.

Dwg.0/1

FS CPI  
 FA AB; DCN  
 MC CPI: E11-Q01; E31-N05C; J01-E03D; M14-A

L55 ANSWER 20 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN  
 AN 970592835 JICST-EPlus

TI **Fixation of carbon dioxide** by model complex of **carbonic anhydrase** active site.

AU NAKATA KO; ICHIKAWA KAZUHIKO

CS Hokkaido Univ., Grad. Sch.

SO Nippon Kagakkai Koen Yokoshu, (1997) vol. 72nd, no. 2, pp. 602. Journal Code: S0493A  
 ISSN: 0285-7626

CY Japan

LA Japanese

STA New

AB It is suggested that in **carbonic anhydrase** **CO2** undergoes nucleophilic attack of hydroxide ion bound to zinc(II) and is **hydrated**. In this work the model complex,  $\zeta\text{ZnL}(\text{OH}_2)^{+2}$  (L=tris(2-benzimidazolylmethyl)amine), was deprotonated by base and reacted with **CO2 gas**. The IR spectrum indicated the production of coordinated **carbonate** ion. (author abst.)

L55 ANSWER 21 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1996:273667 HCAPLUS

DN 124:324242

ED Entered STN: 11 May 1996

TI **Carbon dioxide** recovery from **waste gases** at low cost and the **carbon dioxide** adsorbents used

IN Hayashi, Hiroshi; Hirano, Shinichi; Shigemoto, Naoya; Yamada, Shinichi

PA Shikoku Sogo Kenkyusho KK, Japan

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C01B031-20

ICS **B01D053-04**; **B01D053-34**; **B01D053-81**; **B01D053-62**; **B01J020-04**

CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 08040715	A2	19960213	JP 1995-114184	19950512
PRAI	JP 1994-108218		19940523		

AB A **gas** containing steam and **CO2** is introduced into a **CO2** adsorbing agent, which is a dried porous material, e.g. activated C, zeolite, alumina, kieselguhr, or their mixture, carrying  $2K_2CO_3 \cdot 3H_2O$  and/or  $Na_2CO_3 \cdot cntdot.H_2O$  in the voids, to recover **CO2** efficiently at low cost from the **gas**. The **CO2** recovering method may further involve a process either to decrease the pressure of the **CO2** adsorbing agent or to introduce steam into the agent in order to release **CO2** captured as  $KHCO_3$  and/or  $NaHCO_3$  in the voids after the **gas** introduction and a process to cool the agent to liquefy steam and recover highly pure **CO2**. The adsorbing agent may be prepared by immersing the dried porous material in an **aqueous** solution containing  $Na_2CO_3$  and/or  $K_2CO_3$  and evaporating the **aqueous** solution to carry  $2K_2CO_3 \cdot 3H_2O$  and/or  $Na_2CO_3 \cdot H_2O$  in the voids.

ST **carbon dioxide removal waste gas;**

adsorbent **waste gas** treatment

IT Adsorbents

Steam

**Waste gases**

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT Kieselguhr

Zeolites, uses

RL: NUU (Other use, unclassified); USES (Uses)

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT 7440-44-0, Activated carbon, uses

RL: NUU (Other use, unclassified); USES (Uses)

(activated; adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT 144-55-8P, Sodium hydrogencarbonate, reactions 298-14-6P

RL: BYP (Byproduct); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT 1344-28-1, Alumina, uses

RL: NUU (Other use, unclassified); USES (Uses)

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT 124-38-9, Carbon dioxide, processes

RL: POL (Pollutant); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

IT 497-19-8, Sodium **carbonate**, reactions 584-08-7, Potassium **carbonate**

RL: RCT (Reactant); RACT (Reactant or reagent)

(adsorbents preparation for **carbon dioxide** removal from **waste gas**)

L55 ANSWER 22 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1996:261820 HCAPLUS

DN 124:297850

ED Entered STN: 03 May 1996

TI Permanent storage of carbon dioxide in the marine environment: The solid **CO2** penetrator

AU Murray, C. N.; Visintini, L.; Bidoglio, G.; Henry, B.

CS Institute Remote Sensing Applications, Ispra, 21020, Italy

SO Energy Conversion and Management (1996), 37(6-8), 1067-72

CODEN: ECMADL; ISSN: 0196-8904

PB Elsevier

DT Journal

LA English

CC 60-5 (Waste Treatment and Disposal)

Section cross-reference(s): 59

AB To circumvent the uncertainty related to presently studied ocean disposal options based on pumping of liquid CO<sub>2</sub> or **hydrate** slurry injection at depth, with the associated risk of short term phys. and biol. oceanog. processes returning an important fraction of it to the atmospheric, a disposal technique using the natural geochem. storage properties of deep marine ( **carbonate** or aluminosilicate rich) sedimentary formations is suggested. The technique proposed would depend on the fact that CO<sub>2</sub> can be obtained as a solid by cooling to -78.5°. The overall d. is approx. one and a half times, .apprx.1.56 kg/dm<sup>3</sup>, that of seawater. If the solid was shaped as a torpedo and then left to fall through the **water** column it would penetrate quite deeply into soft underlying sediments. This conclusion is based on in-situ investigations using penetrators that were studied as a disposal option for other solid wastes. This concept should, therefore, provide permanent storage as the emplaced CO<sub>2</sub> will be chemical **sequestered** by the sediments (via the formation of an intermediate clathrate). Other than secure segregation of the emplaced CO<sub>2</sub>, the penetrator option has a further major advantage in that there should be no long-term effects to biol. systems: penetrator disposal is deep within sedimentary formations which have zero or very low biol. activity.

ST carbon dioxide marine disposal solid penetrator

IT Flue **gases**

**Waste gases**

Waste solids

(permanent storage of **carbon dioxide** in marine environment using solid CO<sub>2</sub> penetrator)

IT 124-38-9, **Carbon dioxide**, processes

RL: **REM (Removal or disposal)**; PROC (Process)

(permanent storage of **carbon dioxide** in marine environment using solid CO<sub>2</sub> penetrator)

L55 ANSWER 23 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1996:11293 HCAPLUS

DN 124:36492

ED Entered STN: 05 Jan 1996

TI Solidification of magnesium **carbonate** by autoclave reaction

IN Shibasaki, Yasuo; Inukai, Keiichi; Kigami, Makoto; Ishida, Hideki; Goto, Yasuo; Nagata, Tatsuya; Yamamoto, Takayuki; Maenami, Hiroki

PA Kogyo Gijutsuin, Japan; Inax Corp

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C04B040-02

ICS B09B003-00; C04B009-00; C04B022-06; C04B028-00

ICI C04B028-00, C04B028-30, C04B022-06; C04B111-00

CC 59-4 (**Air** Pollution and Industrial Hygiene)

Section cross-reference(s): 58

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 07267758	A2	19951017	JP 1994-62357	19940331

JP 3341009 B2 20021105

PRAI JP 1994-62357 19940331

- AB The process comprises solidifying  $MgCO_3$  or  $MgCO_3$ -based materials by autoclave reaction, optionally (1) mixing the materials with (a) siliceous materials, (b) substances increasing solubility of  $MgCO_3$ , or (c) siliceous materials and substances increasing solubility of  $MgCO_3$  and/or siliceous materials before the autoclave reaction, (2) using solns. of substances increasing solubility of  $MgCO_3$  as autoclave treatment solns., or (3) mixing the materials with siliceous materials before the autoclave reaction and using solns. of substances increasing solubility of  $MgCO_3$  and/or siliceous materials as autoclave treatment solns. The solidified materials of  $MgCO_3$  or  $(Ca.Mg)CO_3$ , which is fixed from **CO<sub>2</sub>** in combustion **waste gases**, are utilized in building and construction materials.
- ST magnesium **carbonate** solidification autoclave reaction; siliceous material magnesium **carbonate** solidification; solely improve magnesium **carbonate** solidification; **waste gas carbon dioxide** fixation; recycling magnesium **carbonate** building material
- IT **Waste gases**  
(fixed **carbon dioxide** from; solidification of magnesium **carbonate** by autoclave reaction)
- IT Silt  
Slags  
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Clays, reactions  
Kieselguhr  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Ashes (residues)  
(of sludges, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Tiles  
(scraps, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Glass, oxide  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(scraps, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Sand  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(siliceous, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Glazes  
(sludges from, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Autoclaves  
(solidification of magnesium **carbonate** by autoclave reaction)
- IT Siliceous materials  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(solidification of magnesium **carbonate** by autoclave reaction)
- IT Building materials  
Recycling

- (solidified magnesium **carbonate** for; solidification of magnesium **carbonate** by autoclave reaction)
- IT Cement  
Concrete  
(**waste, magnesium carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Ashes (residues)  
(coal, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT **Wastes**  
(industrial, **magnesium carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT **Waste solids**  
(sludges, solidification of **magnesium carbonate** by autoclave reaction)
- IT 14808-60-7, Quartz (SiO<sub>2</sub>), reactions  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(Cristalite VX-X; solidification of magnesium **carbonate** by autoclave reaction)
- IT 60676-86-0, Silica, vitreous  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(Fuselex FF; solidification of magnesium **carbonate** by autoclave reaction)
- IT 7631-86-9, Silica, reactions  
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT **546-93-0, Magnesium carbonate** 12125-28-9, Basic magnesium **carbonate**  
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)  
(solidification of magnesium **carbonate** by autoclave reaction)
- IT 144-55-8, Sodium **carbonate** (NaHCO<sub>3</sub>), uses 298-14-6, Potassium **carbonate** (KHCO<sub>3</sub>) 497-19-8, Sodium **carbonate** (Na<sub>2</sub>CO<sub>3</sub>), uses 506-87-6, Ammonium **carbonate** ((NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>) 554-13-2, Lithium **carbonate** (Li<sub>2</sub>CO<sub>3</sub>) 584-08-7, Potassium **carbonate** (K<sub>2</sub>CO<sub>3</sub>) 1066-33-7 1310-58-3, Potassium hydroxide, uses 1310-65-2, Lithium hydroxide 1310-73-2, Sodium hydroxide, uses 5006-97-3, Lithium **carbonate** (LiHCO<sub>3</sub>) 6484-52-2, Ammonium nitrate, uses 7447-40-7, Potassium chloride, uses 7447-41-8, Lithium chloride, uses 7550-35-8, Lithium bromide 7631-99-4, Sodium nitrate, uses 7647-14-5, Sodium chloride, uses 7647-15-6, Sodium bromide, uses 7757-79-1, Potassium nitrate, uses 7758-02-3, Potassium bromide, uses 7790-69-4, Lithium nitrate 10124-37-5, Calcium nitrate 12124-97-9, Ammonium bromide 12125-02-9, Ammonium chloride, uses  
RL: MOA (Modifier or additive use); USES (Uses)  
(solubility improvers; solidification of magnesium **carbonate** by autoclave reaction)
- IT **124-38-9, Carbon dioxide**, processes  
RL: **REM (Removal or disposal)**; PROC (Process)  
(**waste gases** containing, **magnesium carbonate** fixed from; solidification of magnesium **carbonate** by autoclave reaction)

L55 ANSWER 24 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1996:13390 HCAPLUS

DN 124:96118

ED Entered STN: 06 Jan 1996

TI **Fixation** of carbon dioxide by using industrial wastes

IN Shibazaki, Yasuo; Inukai, Keiichi; Kigami, Makoto; Ishida, Hideki; Goto, Yasuo; Nagata, Tatsuya; Yamamoto, Takayuki; Maenami, Hiroki

PA Kogyo Gijutsuin, Japan; Inax Corp

SO Jpn. Kokai Tokkyo Koho, 3 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01J019-00

ICS C01B031-20; C01B031-24; C01F005-24; C01F011-18

CC 59-4 (**Air Pollution** and Industrial Hygiene)

Section cross-reference(s): 60

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 07265688	A2	19951017	JP 1994-62360	19940331
PRAI	JP 1994-62360		19940331		

AB The process comprises contacting industrial wastes containing CaO and/or MgO with **H2O** to dissolve Ca<sup>2+</sup> and/or Mg<sup>2+</sup> in **H2O** and contacting the resulting **water** with **CO2 gas** to form CaCO<sub>3</sub> and/or MgCO<sub>3</sub>. **CO2** discharged from industrial **waste gases** is efficiently **fixed** by the low-cost process.

ST carbon dioxide **fixation** industrial waste; calcium **carbonate** formation carbon dioxide; magnesium **carbonate** formation carbon dioxide

IT Flue **gases**
**Waste gases**

(carbon dioxide from; **fixation** of **carbon dioxide** by using industrial wastes)

IT Slags

(**fixation** of carbon dioxide by using industrial wastes)

IT Waste solids

(industrial, **fixation** of carbon dioxide by using industrial wastes)

IT **471-34-1P**, Calcium **carbonate**, preparation

**546-93-0P**

RL: PNU (Preparation, unclassified); PREP (Preparation)

(carbon dioxide **fixed** as; **fixation** of carbon dioxide by using industrial wastes)

IT **124-38-9**, Carbon dioxide, processes

RL: PEP (Physical, engineering or chemical process); **REM (Removal or disposal)**; PROC (Process)

(**fixation** of **carbon dioxide** by using industrial wastes)

IT 1305-78-8, Calcium oxide, reactions 1309-48-4, Magnesium oxide, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(industrial waste components; **fixation** of carbon dioxide by using industrial wastes)

L55 ANSWER 25 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1995:571392 HCAPLUS



DN 123:151252  
 ED Entered STN: 25 May 1995  
 TI Hydrothermal crystallization of calcium **carbonate**  
 IN Kigami, Makoto; Ishida, Hideki; Nagata, Tatsuya  
 PA Inax Corp, Japan  
 SO Jpn. Kokai Tokkyo Koho, 5 pp.  
 CODEN: JKXXAF  
 DT Patent  
 LA Japanese  
 IC ICM C04B007-13  
 ICS C04B007-00; C04B007-34; C04B040-02  
 CC 58-6 (Cement, Concrete, and Related Building Materials)  
 Section cross-reference(s): 59

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 07061842	A2	19950307	JP 1993-209399	19930824
	JP 3240766	B2	20011225		
PRAI	JP 1993-209399		19930824		
AB	The process comprises autoclaving CaCO <sub>3</sub> (I) or I-based materials, optionally mixed with siliceous materials. The solid products are suitable for use as building materials. The process is useful for hydrothermally crystg.7 I obtained from CO <sub>2</sub> removal from <b>waste gases</b> .				
ST	calcium <b>carbonate</b> silica hydrothermal crystn; <b>waste gas carbon dioxide calcium carbonate</b>				
IT	Building materials <b>Waste gases</b> (hydrothermal crystallization of <b>calcium carbonate</b> from CO <sub>2</sub> removal from <b>waste gases</b> , optionally with silica, for building materials)				
IT	Crystallization (hydrothermal, hydrothermal crystallization of <b>calcium carbonate</b> from CO <sub>2</sub> removal from <b>waste gases</b> , optionally with silica, for building materials)				
IT	14808-60-7, Quartz (SiO <sub>2</sub> ), processes 60676-86-0 RL: PEP (Physical, engineering or chemical process); PROC (Process) (hydrothermal crystallization of <b>calcium carbonate</b> from CO <sub>2</sub> removal from <b>waste gases</b> , optionally with silica, for building materials)				
IT	124-38-9, Carbon dioxide, processes RL: REM (Removal or disposal); PROC (Process) (hydrothermal crystallization of <b>calcium carbonate</b> from CO <sub>2</sub> removal from <b>waste gases</b> , optionally with silica, for building materials)				
IT	471-34-1, Calcium <b>carbonate</b> , processes RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process) (hydrothermal crystallization of <b>calcium carbonate</b> from CO <sub>2</sub> removal from <b>waste gases</b> , optionally with silica, for building materials, Hakuenka PZ)				
L55	ANSWER 26 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN				
AN	1995:283667 HCAPLUS				
DN	122:37761				
ED	Entered STN: 10 Jan 1995				
TI	Salt <b>Hydrates</b> : New Reversible Absorbents for Carbon Dioxide				

AU Quinn, R.; Appleby, J. B.; Pez, G. P.  
CS Corporate Science and Technology Center, Air Products and Chemicals Inc.,  
Allentown, PA, 18195-1501, USA  
SO Journal of the American Chemical Society (1995), 117(1), 329-35  
CODEN: JACSAT; ISSN: 0002-7863  
PB American Chemical Society  
DT Journal  
LA English  
CC 59-4 (Air Pollution and Industrial Hygiene)  
AB Melts of salt **hydrates** such as tetramethylammonium fluoride tetrahydrate,  $[(CH_3)_4N]F \cdot 4H_2O$ , and tetraethylammonium acetate tetrahydrate,  $[(C_2H_5)_4N]CH_3CO_2 \cdot 4H_2O$ , have been found to exhibit unexpectedly large CO<sub>2</sub> absorption capacities. For example,  $[(CH_3)_4N]F \cdot 4H_2O$  at 50° and 100 kPa CO<sub>2</sub> absorbs 0.28 mol of **gas**/mol of salt corresponding to a CO<sub>2</sub> concentration of .apprx.1.9M. Absorption is fully reversible and **gas** is desorbed by reducing the CO<sub>2</sub> pressure above the melt. A survey of salt **hydrates** revealed that those which contain relatively basic anions, such as malonate or citrate, likewise exhibit relatively large CO<sub>2</sub> absorption capacities while those which contain relatively neutral anions, such as chloride, do not. The CO<sub>2</sub> absorption capacity of salt **hydrates** is dependent on the **water** content of the salt and decreases with increasing **water** content. Characterization by NMR and FTIR of  $[(CH_3)_4N]F \cdot 4H_2O$  containing absorbed CO<sub>2</sub> is consistent with the presence of **bicarbonate** and bifluoride ions in the melt. Exposure of  $[(CH_3)_4N]F$  containing H<sub>2</sub>18O to CO<sub>2</sub> resulted in incorporation of the label into the gas phase as C18O16O and C18O2, implying that CO<sub>2</sub> reacts reversibly with the melt via a **hydration** reaction. Spectroscopic evidence suggests that carboxylate-containing salt **hydrates** also bind CO<sub>2</sub> as **bicarbonate** but the nature of the protonated anion species remains undetd. However, modeling of isotherm data suggests a one-to-one salt **hydrate**-to-CO<sub>2</sub> reaction stoichiometry. In contrast, modeling of fluoride-containing salt **hydrate** isotherms supports a two-to-one salt **hydrate**-to-CO<sub>2</sub> reaction stoichiometry, which is consistent with spectroscopic and reactivity studies of the underlying chemical. The heats of absorption of CO<sub>2</sub> by  $[(CH_3)_4N]F \cdot 4H_2O$  and  $[(C_2H_5)_4N]CH_3CO_2 \cdot 4H_2O$  are relatively low, -4.5 and -8.4 kcal/mol, resp., suggesting that these may be attractive, more energy efficient, alternatives to com. amine based absorbents for the removal of CO<sub>2</sub>.  
ST salt **hydrate** carbon dioxide absorbent  
IT **Hydrates**  
RL: NUU (Other use, unclassified); USES (Uses)  
(adsorbent; carbon dioxide removal from air by absorption with)  
IT Air pollution  
**Waste gases**  
(carbon dioxide removal by absorption with salt  
**hydrates**)  
IT 17787-40-5, Tetramethylammonium fluoride tetrahydrate 67533-12-4,  
Tetraethylammonium acetate tetrahydrate  
RL: NUU (Other use, unclassified); USES (Uses)  
(adsorbent; carbon dioxide removal from air by absorption with)  
IT 124-38-9P, **Carbon dioxide**, processes  
RL: POL (Pollutant); PUR (Purification or recovery); **REM (Removal or disposal)**; OCCU (Occurrence); PREP (Preparation); PROC (Process)  
(removal from air by absorption with salt **hydrates**)

L55 ANSWER 27 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

AN 1994:540664 HCAPLUS  
 DN 121:140664  
 ED Entered STN: 17 Sep 1994  
 TI Method for reducing atmospheric pollution by carbon dioxide and sulfur dioxide  
 IN Eyal, Meir Aharon  
 PA Godwin, Edgar James, UK; Hamit Energy AS  
 SO PCT Int. Appl., 27 pp.  
 CODEN: PIXXD2  
 DT Patent  
 LA English  
 IC ICM B01D053-34  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)  
 Section cross-reference(s): 51

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9412266	A1	19940609	WO 1993-GB2406	19931123
	W: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, UZ, VN				
	RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
	IL 103918	A1	19961016	IL 1992-103918	19921129
	CA 2150363	AA	19940609	CA 1993-2150363	19931123
	CA 2150363	C	20010508		
	AU 9455318	A1	19940622	AU 1994-55318	19931123
	EP 670750	A1	19950913	EP 1994-900249	19931123
	EP 670750	B1	19970528		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, NL, PT, SE				
	JP 08503884	T2	19960430	JP 1993-512899	19931123
	AT 153557	E	19970615	AT 1994-900249	19931123
	ES 2104328	T3	19971001	ES 1994-900249	19931123
	PL 175655	B1	19990129	PL 1993-309221	19931123
	CZ 290653	B6	20020911	CZ 1995-1355	19931123
	FI 9502572	A	19950717	FI 1995-2572	19950526
	NO 9502093	A	19950726	NO 1995-2093	19950526
	US 5958353	A	19990928	US 1995-436392	19950727
PRAI	IL 1992-103918	A	19921129		
	WO 1993-GB2406	W	19931123		
AB	For reducing atmospheric pollution caused by <b>CO2</b> and SO2 in industrial <b>gases</b> being emitted to the atmospheric, through the conversion of CO2 to calcium <b>carbonate</b> and the conversion of SO2 to calcium sulfite using conventionally available calcium salt-containing reactant, the method comprises reacting the gas prior to venting with an alkali base and an <b>aqueous</b> liquor, whereby the pollutant reacts with the base and transfers to the liquor, and the resulting gas vented to the atmospheric has a reduced pollutant content; and reacting the pollutant-loaded liquor with a calcium salt-containing reactant to form calcium <b>carbonate</b> and calcium sulfite, with co-formation of a com. utilizable salt containing an anion from the calcium salt reactant and a cation from the alkali base.				
ST	<b>carbon dioxide</b> removal industrial <b>gas</b> ; sulfur dioxide removal industrial <b>gas</b> ; <b>waste gas</b> <b>carbon dioxide</b> sulfur dioxide				
IT	Phosphate rock and Phosphorite RL: USES (Uses) (in <b>carbon dioxide</b> /sulfur dioxide removal from industrial <b>waste gases</b> )				

IT **Waste gases**  
(industrial, **carbon dioxide**/sulfur dioxide removal from)

IT 10257-55-3, Calcium sulfite  
RL: OCCU (Occurrence)  
(**carbon dioxide** removal from industrial **waste gases** as)

IT **471-34-1**, Calcium **carbonate**, miscellaneous  
RL: MSC (Miscellaneous)  
(**carbon dioxide** removal from industrial **waste gases** as)

IT 506-87-6, Ammonium **carbonate** 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses 7664-38-2, Phosphoric acid, uses 7664-41-7, Ammonia, uses 7697-37-2, Nitric acid, uses 7758-87-4, Calcium phosphate 7783-20-2, Ammonium sulfate, uses 10043-52-4, Calcium chloride, uses 10124-37-5, Calcium nitrate 13397-24-5, Gypsum, uses  
RL: OCCU (Occurrence)  
(in **carbon dioxide**/sulfur dioxide removal from industrial **waste gases**)

IT **124-38-9**, Carbon dioxide, miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from industrial **waste gases**, as **calcium carbonate**)

IT 7446-09-5, Sulfur dioxide, miscellaneous  
RL: REM (Removal or disposal); PROC (Process)  
(removal of, from industrial **waste gases**, as calcium sulfite)

L55 ANSWER 28 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1994:662514 HCAPLUS  
DN 121:262514  
ED Entered STN: 26 Nov 1994  
TI Plants for recovery of carbon dioxide  
IN Harashina, Heihachi  
PA Ishikawajima Harima Heavy Ind, Japan  
SO Jpn. Kokai Tokyo Koho, 5 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
IC ICM C01F011-18  
ICS B01D053-34; C01B031-20  
CC 59-4 (**Air Pollution** and Industrial Hygiene)  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 06211518	A2	19940802	JP 1993-5426	19930114
	JP 3395228	B2	20030407		
PRAI	JP 1993-5426		19930114		

AB The plants, for formation of CaCO<sub>3</sub> by the reaction of **CO<sub>2</sub>** **gas** with Ca(OH)<sub>2</sub>, are equipped with the means for controlling the amount of injection of **H<sub>2</sub>O** at saturated amount corresponding to the amount of Ca(OH)<sub>2</sub> added, precipitation-separation tanks for precipitation of CaCO<sub>3</sub> from mixts. containing **CO<sub>2</sub>**, Ca(OH)<sub>2</sub>, and **H<sub>2</sub>O** and solubilization of the unreacted Ca(OH)<sub>2</sub> in **H<sub>2</sub>O**, and the means, connected with the precipitation-separation tanks, for recovery and recirculation of the Ca(OH)<sub>2</sub>.

ST carbon dioxide removal calcium hydroxide; calcium **carbonate**

formation decarbonization

IT **Waste gases**  
(removal of **carbon dioxide** by calcium **carbonate** formation with calcium hydroxide and recovery of unreacted calcium hydroxide)

IT **471-34-1, Calcium carbonate, processes**  
RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); **REM (Removal or disposal)**; FORM (Formation, nonpreparative); PROC (Process)  
(immobilization of **carbon dioxide** by calcium **carbonate** formation with calcium hydroxide and recovery of unreacted calcium hydroxide)

IT 1305-62-0, Calcium hydroxide, reactions  
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)  
(immobilization of carbon dioxide by calcium **carbonate** formation with calcium hydroxide and recovery of unreacted calcium hydroxide)

IT **124-38-9, Carbon dioxide, reactions**  
RL: RCT (Reactant); **REM (Removal or disposal)**; PROC (Process); RACT (Reactant or reagent)  
(immobilization of **carbon dioxide** by calcium **carbonate** formation with calcium hydroxide and recovery of unreacted calcium hydroxide)

L55 ANSWER 29 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1994:685808 HCAPLUS  
DN 121:285808  
ED Entered STN: 10 Dec 1994  
TI Removal of **carbon dioxide** from **waste gases** using calcium chloride from the Solvay soda process  
IN Legat, Werner  
PA Solvay Umweltchemie GmbH, Germany  
SO Ger. Offen., 3 pp.  
CODEN: GWXXBX  
DT Patent  
LA German  
IC ICM B01D053-34  
ICS C01D007-18; C01F011-24  
CC 59-4 (**Air** Pollution and Industrial Hygiene)  
Section cross-reference(s): 49

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 4308250	A1	19940922	DE 1993-4308250	19930316
PRAI	DE 1993-4308250		19930316		
AB	CO2 is adsorbed in the presence of NaOH, KOH, Fe(OH)3 or Al(OH)3 using CaCl2 and forming CaCO3.				
ST	carbon dioxide absorption calcium chloride				
IT	<b>Flue gases</b> (removal of <b>carbon dioxide</b> from <b>waste gases</b> using calcium chloride from the Solvay soda process)				
IT	<b>471-34-1, Calcium carbonate, formation (nonpreparative)</b> RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative) (removal of <b>carbon dioxide</b> from <b>waste gases</b> using calcium chloride from the Solvay soda process)				
IT	497-19-8, Soda, miscellaneous RL: MSC (Miscellaneous)				

(removal of **carbon dioxide** from waste  
gases using calcium chloride from the Solvay soda process)  
IT 1332-37-2, Iron oxide, uses 1344-28-1, Aluminum oxide 10043-52-4,  
Calcium chloride, uses 11113-66-9, Iron hydroxide 21645-51-2, Aluminum  
hydroxide, uses  
RL: NUU (Other use, unclassified); USES (Uses)  
(removal of **carbon dioxide** from waste  
gases using calcium chloride from the Solvay soda process)  
IT 124-38-9, **Carbon dioxide**, processes  
RL: POL (Pollutant); REM (Removal or disposal); OCCU  
(Occurrence); PROC (Process)  
(removal of **carbon dioxide** from waste  
gases using calcium chloride from the Solvay soda process)

L55 ANSWER 30 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1993:656269 HCAPLUS  
DN 119:256269  
ED Entered STN: 11 Dec 1993  
TI Anticorrosion compositions used in **water** systems, wastewater  
treatment, and flue gas desulfurization  
IN Ferrara, Marcello; Scopelliti, Maria Gabriella  
PA Meg S.N.C. Di Scopelliti Sofia and C., Italy  
SO PCT Int. Appl., 43 pp.  
CODEN: PIXXD2  
DT Patent  
LA English  
IC ICM C02F001-00  
ICS C02F005-08; C02F005-02; C02F001-52  
CC 61-8 (Water)  
Section cross-reference(s): 59, 60

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9320013	A1	19931014	WO 1993-IT26	19930329
	W: AU, BR, CA, FI, JP, KR, NO, RU, US				
	RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
	CA 2110066	AA	19931014	CA 1993-2110066	19930329
	AU 9339039	A1	19931108	AU 1993-39039	19930329
	EP 603345	A1	19940629	EP 1993-908063	19930329
	R: BE, DE, DK, ES, FR, GB, NL, SE				
	JP 07500286	T2	19950112	JP 1993-517281	19930329
	US 5683587	A	19971104	US 1995-580487	19951229
	US 5961837	A	19991005	US 1997-879656	19970620
PRAI	IT 1992-ME2		19920330		
	IT 1992-ME6		19920527		
	IT 1992-ME7		19920618		
	WO 1993-IT26		19930329		
	US 1993-142463		19931126		
	US 1995-580487		19951229		
AB	A process and <b>water</b> composition to reduce $\geq 1$ of the following corrosion, scale, fouling, and biofouling in <b>water</b> treatment; wastewater treatment and/or solid and/or sludge disposal problems; and SO <sub>x</sub> , NO <sub>x</sub> and CO <sub>2</sub> in a <b>gaseous</b> mixture involves using Na <sub>2</sub> CO <sub>3</sub> NaHCO <sub>3</sub> supplemented with lime and/or NaOH and minor amts. of polymers, phosphonates, biocides, and antifoaming agents to treat the <b>water</b> . The formed sludges are fed to a desulfurization unit to remove SO <sub>x</sub> , NO <sub>x</sub> and CO <sub>2</sub> .				
ST	corrosion prevention <b>water</b> purifn; wastewater treatment sludge				

disposal; flue gas desulfurization anticorrosion compn  
 IT Flue gases  
   (sulfur oxide and nitrogen oxide removal from, corrosion prevention  
   **water** treatment combined with process for)  
 IT **Water** purification  
   (corrosion prevention, of recirculating **water**, formulated  
   comps. for)  
 IT Wastewater treatment  
   (corrosion prevention, of sewage effluents, formulated comps. for)  
 IT 7440-50-8, Copper, reactions  
   RL: PEP (Physical, engineering or chemical process); PROC (Process)  
   (corrosion of, prevention of, **water** treatment for)  
 IT 144-55-8, Sodium **bicarbonate**, reactions 497-19-8, Sodium  
   **carbonate**, reactions 1310-73-2, Sodium hydroxide, reactions  
   RL: RCT (Reactant); RACT (Reactant or reagent)  
   (corrosion prevention **water** treatment with)  
 IT **124-38-9, Carbon dioxide**, miscellaneous  
   11104-93-1, Nitrogen oxide, miscellaneous 12624-32-7, Sulfur oxide  
   RL: **REM (Removal or disposal)**; PROC (Process)  
   (removal of, from flue **gases** and **waste**  
   **gases**, corrosion prevention **water** treatment combined  
   with process for)  
 IT 57-13-6, Urea, uses 64-18-6, Formic acid, uses 74-82-8, Methane, uses  
   **77-92-9, Citric acid**, uses **471-34-1, Calcium**  
   **carbonate**, uses 584-08-7, Potassium **carbonate**  
   1305-62-0, Calcium hydroxide, uses 1305-78-8, Calcium oxide, uses  
   1309-42-8, Magnesium hydroxide 1309-48-4, Magnesium oxide, uses  
   1317-38-0, Copper oxide (CuO), uses 7487-88-9, Magnesium sulfate, uses  
   7647-14-5, Sodium chloride, uses 7664-41-7, Ammonia, uses 7757-82-6,  
   Sodium sulfate, uses 7757-83-7, Sodium sulfite 7783-06-4, Hydrogen  
   sulfide, uses  
   RL: USES (Uses)  
   (sorbent, in **wastewater** treatment).

L55 ANSWER 31 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1993:677881 HCAPLUS  
 DN 119:277881  
 ED Entered STN: 25 Dec 1993  
 TI Method and apparatus for gas-liquid contacting  
 IN Smith, James W.; Ellenor, David Todd R.; Harbinson, John N.  
 PA University of Toronto Innovations Foundation, Can.; Apollo Environmental  
   Systems Corp.  
 SO PCT Int. Appl., 90 pp.  
   CODEN: PIXXD2  
 DT Patent  
 LA English  
 IC ICM B01D053-18  
   ICS B01F003-04; B03D001-16; A62D003-00; C01B017-05; C02F001-24  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)  
   Section cross-reference(s): 48, 60  
 FAN.CNT 3

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9319836	A1	19931014	WO 1993-CA148	19930405
W: AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US				
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE,				

BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG

CA 2004652	AA	19910605	CA 1989-2004652	19891205
CA 2004652	C	19990831		
US 5352421	A	19941004	US 1992-863720	19920403
AU 9338850	A1	19931108	AU 1993-38850	19930405
AU 667093	B2	19960307		
ZA 9302464	A	19941005	ZA 1993-2464	19930405
EP 633810	A1	19950118	EP 1993-907723	19930405
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE				
JP 07507005	T2	19950803	JP 1993-516938	19930405
JP 10244122	A2	19980914	JP 1998-22062	19930405
CA 2133454	C	20010724	CA 1993-2133454	19930405
US 5413765	A	19950509	US 1994-230230	19940420
NO 9403651	A	19941202	NO 1994-3651	19940930
FI 9404613	A	19941124	FI 1994-4613	19941003
US 5520818	A	19960528	US 1994-313153	19941129
US 5730784	A	19980324	US 1995-462692	19950605
AU 9650808	A1	19960627	AU 1996-50808	19960423
AU 678936	B2	19970612		
AU 9650809	A1	19960627	AU 1996-50809	19960423
AU 679407	B2	19970626		
PRAI US 1992-863720	A2	19920403		
CA 1989-2004652	A	19891205		
US 1989-446776	B2	19891206		
GB 1990-2462	A	19900205		
US 1990-582423	B2	19900914		
US 1990-622485	A2	19901205		
US 1992-863729	A2	19920403		
JP 1993-516938	A3	19930405		
WO 1993-CA148	A	19930405		
US 1994-313153	A1	19941129		
AB	Components, usually but not exclusively gaseous components, are removed from gas or liquid streams using a liquid or gas, resp., and chemical converted into an insol. phase or phys. removed. H2S may be removed from gas streams by oxidation in <b>aqueous</b> chelated transition metal solution in a modified agitated flotation cell. The same principle may be employed with other procedures in which a gaseous phase is dispersed in a liquid phase to effect an interaction between components present in such phases, for example, to treat or strip or react a component of the liquid phase. The gas-liquid contacting apparatus may be a combined chemical reactor and solid product separation device. In order to effect efficient mass transfer and rapid reaction, gas bubbles are formed by rotating an impeller at a blade tip velocity of .gtorsim.350 in/s to achieve the required shear. To assist in the reaction, a surrounding shroud has a plurality of openings, generally of aspect ratio of approx. 1, of equal diameter and arranged in uniform pattern, such as to provide a gas flow there through .ltorsim.0.02 lb/min-opening in the shroud. In general, the gas velocity index of gas through the openings in the shroud is .gtorsim.18/s-opening, preferably .gtorsim.24/s-opening. Each of the openings has an area corresponding to an equivalent diameter .ltorsim.1 in.			
ST	hydrogen sulfide removal <b>waste gas</b> ; sulfur dioxide removal <b>waste gas</b> ; <b>carbon dioxide</b> removal <b>waste gas</b> ; gas liq contacting			
IT	Wastewater treatment (removal of gases and volatile components in gas-liquid contact apparatus)			
IT	<b>Waste gases</b> (removal of hydrogen sulfide and sulfur dioxide from <b>waste</b>			



- gas streams in gas-liquid contact apparatus)
- IT Contacting apparatus  
(gas-liquid, for removal of gases from or with liqs.)
- IT 7487-88-9, Magnesium sulfate, uses  
RL: USES (Uses)  
(anticaking agent, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
- IT 1305-62-0, Calcium hydroxide, uses  
RL: USES (Uses)  
(for **carbon dioxide** removal from **waste gas** streams in gas-liquid contact apparatus)
- IT **471-34-1P**, Calcium **carbonate**, preparation  
RL: FORM (Formation, nonpreparative); PREP (Preparation)  
(formation of, in **carbon dioxide** removal from **waste gas** streams in gas-liquid contact apparatus)
- IT 7704-34-9P, Sulfur, preparation 7778-18-9P, Calcium sulfate  
10257-55-3P, Calcium sulfite  
RL: FORM (Formation, nonpreparative); PREP (Preparation)  
(formation of, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
- IT 11113-66-9, Iron hydroxide  
RL: OCCU (Occurrence)  
(hydrogen sulfide oxidation in presence of **aqueous** iron chelate and, for removal from **waste gas** streams with **gas**-liquid contact apparatus)
- IT 15275-07-7, Iron EDTA 17084-02-5  
RL: OCCU (Occurrence)  
(hydrogen sulfide oxidation in presence of **aqueous**, for removal from **waste gas** streams with **gas**-liquid contact apparatus)
- IT 1310-73-2, Sodium hydroxide, uses 7782-44-7, Oxygen, uses  
RL: USES (Uses)  
(in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
- IT 1330-78-5, Tricresyl phosphate 7664-38-2P, Phosphoric acid, preparation  
RL: OCCU (Occurrence)  
(in solution for removal of sulfur dioxide from **waste gas** streams in gas-liquid contact apparatus)
- IT 7757-82-6, Sodium sulfate, miscellaneous  
RL: MSC (Miscellaneous)  
(precipitation of, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
- IT 7446-09-5, Sulfur dioxide, miscellaneous 7783-06-4, Hydrogen sulfide, miscellaneous  
RL: REM (Removal or disposal); PROC (Process)  
(removal of, from **waste gas** streams, by oxidation in **aqueous** chelated transition metal solution, with gas-liquid contact apparatus)
- IT **124-38-9**, **Carbon dioxide**, miscellaneous  
RL: REM (Removal or disposal); PROC (Process)  
(removal of, from **waste gas** streams, with calcium hydroxide in gas-liquid contact apparatus)
- L55 ANSWER 32 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1994:37267 HCAPLUS  
DN 120:37267  
ED Entered STN: 22 Jan 1994  
TI Removal of **carbon dioxide** and sulfur oxides from

combustion **waste gases**

IN Fujii, Masumi; Suda, Taiichiro; Hotsuta, Zenji; Kobayashi, Kenji; Yoshida, Kunihiro; Shimojo, Shigeru; Kitamura, Koichi; Kawasaki, Masami; Seto, Tooru; Et, Al.

PA Kansai Electric Power Co, Japan; Mitsubishi Heavy Industries, Ltd.

SO Jpn. Kokai Tokkyo Koho, 8 pp.  
CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-34  
ICS B01D053-34; F23J015-00

CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05245338	A2	19930924	JP 1992-45244	19920303
	JP 3305001	B2	20020722		
PRAI	JP 1992-45244		19920303		

AB The process comprises desulfurizing the gases by a high-performance desulfurization process to have SOx concentration in the treated **gases** 5-10 ppm, removing CO2 by contacting the **gases** with an **aqueous** alkanolamine solution, and simultaneously removing SOx to have SOx concentration in the gases ≤1 ppm. The process saves energy for desulfurization and expensive alkanolamines.

ST **carbon dioxide** removal **waste gas**;  
sulfur oxide removal **waste gas**; alkanolamine carbon dioxide removal

IT **Waste gases**  
(**carbon dioxide** and sulfur oxide removal from, high-performance desulfurization process and alkanolamine treatment for)

IT Alcohols, uses  
RL: USES (Uses)  
(amino, **waste gases** treatment with, for **carbon dioxide** and sulfur dioxide removal)

IT 12624-32-7, Sulfur oxide  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from combustion **waste gases**, **carbon dioxide** removal and)

IT 124-38-9, Carbon dioxide, miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from combustion **waste gases**, desulfurization and)

IT 471-34-1, Calcium carbonate, miscellaneous  
RL: MSC (Miscellaneous)  
(slurry containing, **waste gases** treatment with, for sulfur oxide removal)

IT 141-43-5, Monoethanolamine, miscellaneous  
RL: MSC (Miscellaneous)  
(**waste gases** treatment with, for **carbon dioxide** and sulfur dioxide removal)

L55 ANSWER 33 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1993:566876 HCAPLUS

DN 119:166876

ED Entered STN: 16 Oct 1993

TI Manufacture of iron oxide-based catalysts for **waste gas** treatment

IN Aoki, Isataka; Matsui, Toshiki; Imai, Tomoyuki; Horiishi, Nanao  
PA Toda Kogyo Corp, Japan  
SO Jpn. Kokai Tokkyo Koho, 6 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
IC ICM B01J023-74  
ICS B01D053-36; B01J037-02  
CC 59-3 (**Air Pollution** and Industrial Hygiene)  
Section cross-reference(s): 67

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05177139	A2	19930720	JP 1991-359298	19911227
	JP 3107109	B2	20001106		
PRAI	JP 1991-359298		19911227		
AB	The title catalysts are manufactured by immersing a monolithic ceramic or metallic support in <b>aqueous</b> solns. of Fe(II) salts and Fe(III) salts and precipitating particles of magnetite on the supports by immersing the impregnated support into <b>aqueous</b> solns. of alkali hydroxides or <b>carbonates</b> . The catalysts show good mech. strength.				
ST	exhaust gas treatment catalyst; flue gas treatment catalyst; iron oxide catalyst <b>waste gas</b> ; magnetite catalyst <b>waste gas</b> treatment				
IT	Exhaust gases Flue gases (catalysts for treatment of, iron oxide on ceramic or metallic supports as, manufacture of)				
IT	Catalysts and Catalysis (iron oxide-based, on monolithic ceramic or metallic supports, for <b>waste gas</b> treatment)				
IT	Ceramic materials and wares (supports, monolithic, for iron oxide catalysts, for <b>waste gas</b> treatment)				
IT	Synthetic fibers RL: USES (Uses) (aluminum silicate, supports, monolithic, for iron oxide catalysts, for <b>waste gas</b> treatment)				
IT	Synthetic fibers RL: USES (Uses) (silica, supports, monolithic, for iron oxide catalysts, for <b>waste gas</b> treatment)				
IT	Synthetic fibers RL: USES (Uses) (zirconium oxide, supports, monolithic, for iron oxide catalysts, for <b>waste gas</b> treatment)				
IT	1309-38-2P, Magnetite, uses 1317-60-8P, Hematite, uses RL: CAT (Catalyst use); PREP (Preparation); USES (Uses) (catalysts, on ceramic or metallic supports, manufacture of, for <b>waste gas</b> treatment)				
IT	1314-23-4, Zirconia, miscellaneous 7631-86-9, Silica, miscellaneous RL: MSC (Miscellaneous) (ceramics, fiber, monolithic supports, for iron oxide catalysts, for <b>waste gas</b> treatment)				
IT	7705-08-0, Ferric chloride, miscellaneous 7720-78-7, Ferrous sulfate 10028-22-5, Ferric sulfate RL: MSC (Miscellaneous) (impregnation with, of ceramic or metallic supports, in manufacture of iron				

oxide-based catalysts for **waste gas** treatment)

IT 124-38-9, **Carbon dioxide**, miscellaneous  
 RL: REM (Removal or disposal); PROC (Process)  
 (removal of, from **waste gases**, iron oxide-based catalysts for)

IT 1302-88-1, Cordierite 150286-23-0  
 RL: USES (Uses)  
 (supports, monolithic, for iron oxide catalysts, for **waste gas** treatment)

L55 ANSWER 34 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1993:566875 HCAPLUS  
 DN 119:166875  
 ED Entered STN: 16 Oct 1993  
 TI Manufacture of iron oxide-based catalysts for **waste gas** treatment  
 IN Aoki, Isataka; Matsui, Toshiki; Imai, Tomoyuki; Horiishi, Nanao  
 PA Toda Kogyo Corp, Japan  
 SO Jpn. Kokai Tokkyo Koho, 6 pp.  
 CODEN: JKXXAF  
 DT Patent  
 LA Japanese  
 IC ICM B01J023-74  
 ICS B01D053-36; B01J037-02  
 CC 59-3 (**Air Pollution** and Industrial Hygiene)  
 Section cross-reference(s): 67  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05177138	A2	19930720	JP 1991-359297	19911227
	JP 3107108	B2	20001106		
PRAI	JP 1991-359297		19911227		

AB The title catalysts are manufactured by immersing a monolithic ceramic or metallic support in **aqueous** solns. of Fe(II) salts, immersing the impregnated support into **aqueous** solns. of alkali hydroxides or **carbonates**, precipitating particles of **water**-containing Fe<sub>2</sub>O<sub>3</sub> on the supports by blowing O-containing gas, washing, drying, and precipitating particles of magnetite on the supports by immersing the Fe<sub>2</sub>O<sub>3</sub>-deposited support in **aqueous** solns. of Fe(OH)<sub>2</sub>. The catalysts show good mech. strength.

ST exhaust gas treatment catalyst; flue gas treatment catalyst; iron oxide catalyst **waste gas**; magnetite catalyst **waste gas** treatment

IT Exhaust gases  
 Flue gases  
 (catalysts for treatment of, iron oxide on ceramic or metallic supports as, manufacture of)

IT Catalysts and Catalysis  
 (iron oxide-based, on monolithic ceramic or metallic supports, for **waste gas** treatment)

IT Ceramic materials and wares  
 (supports, monolithic, for iron oxide catalysts, for **waste gas** treatment)

IT Synthetic fibers  
 RL: USES (Uses)  
 (aluminum silicate, supports, monolithic, for iron oxide catalysts, for **waste gas** treatment)

IT Synthetic fibers

RL: USES (Uses)  
 (silica, supports, monolithic, for iron oxide catalysts, for  
**waste gas** treatment)

IT Synthetic fibers  
 RL: USES (Uses)  
 (zirconium oxide, supports, monolithic, for iron oxide catalysts, for  
**waste gas** treatment)

IT 1309-38-2P, Magnetite, uses 1310-14-1P, Goethite 1317-60-8P, Hematite,  
 uses  
 RL: CAT (Catalyst use); PREP (Preparation); USES (Uses)  
 (catalysts, on ceramic or metallic supports, manufacture of, for  
**waste gas** treatment)

IT 1314-23-4, Zirconia, miscellaneous 7631-86-9, Silica, miscellaneous  
 RL: MSC (Miscellaneous)  
 (ceramics, fiber, monolithic supports, for iron oxide catalysts, for  
**waste gas** treatment)

IT 7720-78-7, Iron sulfate (FeSO4) 18624-44-7, Ferrous hydroxide  
 RL: USES (Uses)  
 (impregnation with, of ceramic or metallic supports, in manufacture of iron  
 oxide-based catalysts for **waste gas** treatment)

IT **124-38-9, Carbon dioxide**, miscellaneous  
 RL: REM (Removal or disposal); PROC (Process)  
 (removal of, from **waste gases**, iron oxide-based  
 catalysts for)

IT 1302-88-1, Cordierite 150286-23-0  
 RL: USES (Uses)  
 (supports, monolithic, for iron oxide catalysts, for **waste**  
**gas** treatment)

L55 ANSWER 35 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1994:306404 HCAPLUS  
 DN 120:306404  
 ED Entered STN: 11 Jun 1994  
 TI Process and devices for utilization and treatment of **waste**  
**gases**  
 IN Shuhan, Liao  
 PA Peop. Rep. China  
 SO Faming Zhuanli Shenqing Gongkai Shuomingshu, 32 pp.  
 CODEN: CNXXEV  
 DT Patent  
 LA Chinese  
 IC ICM B01D053-34  
 ICS B01D053-18; B01D047-04; F22B001-18; F27D017-00  
 CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	CN 1077657	A	19931027	CN 1992-102885	19920417
PRAI	CN 1992-102885		19920417		

AB **Waste gases** are treated by driving the gases by a fan  
 through a foam layer of an absorbent solution generated in a foam generator,  
 to sep. components from the gas by the phys. and chemical reactions between  
 the absorbent and the components, and recovering the components sep. by a  
 foam reducer, a crystallizing container, an atomizer, a heat exchanger, and/or  
 a  
 filter. The absorbent solution may be an **aqueous** or oil solution and may  
 contain additives selected from foaming agents, sodium **carbonate**  
 , sodium **bicarbonate**, cadmium hydroxide and sodium hydroxide.

This method is useful for removing particles and tar from the **gas**, recovering **waste** heat from the **gas** to generate steam and hot **water**, recovering SO<sub>2</sub> as Na<sub>2</sub>SO<sub>3</sub> or NaHSO<sub>3</sub>, and recovering CO<sub>2</sub> as lightwt. CaCO<sub>3</sub>. The devices include chambers for removing dust, generating steam, producing distilled **water**, recovering Na<sub>2</sub>SO<sub>3</sub>, and recovering lightwt. CaCO<sub>3</sub>; and comprises foam generators, foam reducers, means for controlling solution level, foam detectors, raw material supplying means, filters, atomizers, crystallizing containers, heat exchangers, blowers, valves, thermal insulators, pipes, and man holes.

ST **waste gas** treatment foam method; dust removal

**waste gas**; sulfur dioxide removal **waste**

**gas**; carbon dioxide removal **waste**

**gas**; heat recovery **waste gas**; tar removal

**waste gases**

IT Tar

RL: REM (Removal or disposal); PROC (Process)

(removal of, from **waste gases**, method and apparatus for)

IT **Waste gases**

(treatment and utilization of, method and apparatus for)

IT Heat

(**waste**, recovery of, from **waste gases**, method and apparatus for)

IT **471-34-1P**, Calcium **carbonate**, preparation

RL: PREP (Preparation)

(manufacture of lightwt., from **carbon dioxide** in **waste gases**, method and apparatus for)

IT 7681-38-1P, Sodium bisulfate 7757-83-7P, Sodium sulfite

RL: IMF (Industrial manufacture); PREP (Preparation)

(manufacture of, from sulfur dioxide in **waste gases**, method and apparatus for)

IT **124-38-9**, Carbon dioxide, miscellaneous

7446-09-5, Sulfur dioxide, miscellaneous

RL: REM (Removal or disposal); PROC (Process)

(removal of, from **waste gases**, method and apparatus for)

L55 ANSWER 36 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1993-387580 [49] WPIX

DNC C1993-172409

TI Ammonia and organic cpds. recovery from gas also containing carbon di oxide - especially from bis urethane production by scrubbing with **aqueous** alkali in combined absorption and rectification column and separating **aqueous** alkali **carbonate** solution.

DC E19 E35

IN HEITMANN, W

PA (CHEM) HUELS AG

CYC 7

PI DE 4217921 A1 19931202 (199349)\* 6p C01C001-12

EP 572778 A2 19931208 (199349) DE C01C001-12

R: BE DE FR GB IT

JP 06115928 A 19940426 (199421) 6p C01C001-12

EP 572778 A3 19940309 (199520) C01C001-12

US 5427759 A 19950627 (199531) 5p C01C001-00

EP 572778 B1 19960619 (199629) DE 8p C01C001-12

R: BE DE FR GB IT

DE 59302990 G 19960725 (199635) C01C001-12

ADT DE 4217921 A1 DE 1992-4217921 19920530; EP 572778 A2 EP 1993-105392

19930401; JP 06115928 A JP 1993-127549 19930528; EP 572778 A3 EP

1993-105392 19930401; US 5427759 A Cont of US 1993-69835 19930601, US  
1994-288232 19940809; EP 572778 B1 EP 1993-105392 19930401; DE 59302990 G  
DE 1993-502990 19930401, EP 1993-105392 19930401

FDT DE 59302990 G Based on EP 572778

PRAI DE 1992-4217921 19920530

REP CA 943324

IC ICM C01C001-12

ICS **B01D053-34**

ICA F25J003-02

AB DE 4217921 A UPAB: 19940126

Recovery of NH<sub>3</sub> and organic cpds. (I) from **gases** containing organic matter, CO<sub>2</sub> and NH<sub>3</sub> involves **removing CO<sub>2</sub>** by scrubbing with **aqueous** alkali solution (II) in a combined absorption and rectification column, discharging NH<sub>3</sub> as top prod. and recovering pure (I) from the sump prod. containing alkali **carbonate** (III) and (I) after separating (III).

Pref. the sump of the column operates at the boiling temperature of the mixture of (III) solution and (I). (II) is an **aqueous** NaOH or KOH solution pref. 10-20 (weight)% NaOH solution The (III) solution is separated by decanting.

**Water** is recovered from the organic phase by distillation and used for dilution of (II).

USE/ADVANTAGE - The process is used for recovering NH<sub>3</sub> and (I) from **waste** gas from bisurethane (IV) production from diamine, urea and alcohol (claimed). NH<sub>3</sub> is recovered as such rather than as (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, the supply of which already greatly exceeds the demand.

Dwg.0/1

FS CPI

FA AB; DCN

MC CPI: E11-Q01; E32-A01

L55 ANSWER 37 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1992:577442 HCAPLUS

DN 117:177442

ED Entered STN: 01 Nov 1992

TI Treatment of **carbon dioxide**-containing **gases**

IN Kuramoto, Masamichi; Asano, Yoshihiko

PA Meidensha Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-34

ICS C02F001-46

CC 59-3 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 04135622	A2	19920511	JP 1990-257749	19900927
JP 1990-257749		19900927		

PI JP 04135622 A2 19920511 JP 1990-257749 19900927

PRAI JP 1990-257749 19900927

AB The gases are treated by introducing the gases into an **aqueous** solution containing Ca<sup>2+</sup>, depositing CaCO<sub>3</sub> from the solution on a neg. electrode at <50  $\mu$ A/cm<sup>2</sup> c.d., and separating the deposit from the electrode by passing a current in an opposite direction at 100-140  $\mu$ A/cm<sup>2</sup> c.d. The gases may be exhaust gases from diesel or gasoline engine or gas turbines.

ST exhaust **gas carbon dioxide** removal; calcium compd carbon dioxide removal; electrodeposition carbon dioxide removal; **waste gas carbon dioxide** removal

IT Exhaust **gases**  
(**carbon dioxide** removal from, by electrodeposition  
as calcium **carbonate**)

IT **Waste gases**  
(from **gas** turbines, **carbon dioxide**  
removal from, by electrodeposition as calcium **carbonate**)

IT Electrodeposition and Electroplating  
(in **carbon dioxide** removal from exhaust and  
**waste gases**, as **calcium carbonate**  
)

IT 1305-62-0, Calcium hydroxide, miscellaneous  
RL: MSC (Miscellaneous)  
(in **carbon dioxide** removal from exhaust and  
**waste gases**, by electrodeposition as **calcium**  
**carbonate**)

IT **471-34-1**, Calcium **carbonate**, miscellaneous  
RL: MSC (Miscellaneous)  
(removal of **carbon dioxide** as, by  
electrodeposition, from exhaust and **waste gases**)

IT **124-38-9**, **Carbon dioxide**, miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from exhaust and **waste gases**, by  
electrodeposition as **calcium carbonate**)

L55 ANSWER 38 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1992:496544 HCAPLUS  
DN 117:96544  
ED Entered STN: 05 Sep 1992  
TI Absorbent solution for carbon dioxide removal in corrosion prevention of  
steel piping  
IN Sekine, Isao; Yuasa, Makoto; Shimoide, Tetsuya; Takaoka, Koichi  
PA Kyoba Plant Engineering K. K., Japan  
SO Jpn. Kokai Tokkyo Koho, 6 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
IC ICM B01D053-34  
ICS B01D053-14; C23F011-06  
ICA C10M135-28; C10M141-10  
ICI C10M141-10, C10M135-28, C10M137-12, C10M133-08; C10N030-12  
CC 59-4 (**Air Pollution** and Industrial Hygiene)  
Section cross-reference(s): 55  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 04035721	A2	19920206	JP 1990-139928	19900531
	JP 06015014	B4	19940302		
PRAI	JP 1990-139928		19900531		

AB An **aqueous** solution containing **carbonate** salts and  $\geq 30$   
ppm, preferably 50-500 ppm, of 2-aminothiophenol (I), and optionally  
1-hydroxyethylidene-1,1-diphosphonic acid and/or diethanolamine, is useful  
for adsorbing **CO2** from process **gas** to prevent  
corrosion in steel piping. Thus, an SS41-steel test plate was immersed  
into a 23 weight% Na2CO3 **aqueous** solution containing 100 ppm of I and then  
saturated with **CO2 gas**, resulting in corrosion inhibition  
of 95.5%, vs. 73.3% for a conventional method.

ST **carbon dioxide** removal **gas** absorbent;  
**waste gas carbon dioxide** adsorbent;



aminothiophenol absorbent carbon dioxide

IT **Waste gases**  
(carbon dioxide removal from, absorbent solution for,  
in corrosion prevention of steel pipings)

IT 497-19-8, Sodium **carbonate**, uses  
RL: USES (Uses)  
(absorbent solution containing aminothiophenol and, for **carbon dioxide** removal from **gases**, in corrosion prevention of steel piping)

IT 137-07-5, 2-Aminothiophenol 2809-21-4, 1-Hydroxyethylidene-1,1-diphosphonic acid 111-42-2, Diethanolamine, uses  
RL: OCCU (Occurrence)  
(absorbent solution containing **carbonate** salt and, for **carbon dioxide** removal from **gases**, in corrosion prevention of steel piping)

IT **124-38-9, Carbon dioxide**, miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from **waste gases**, absorbent solution for, in corrosion prevention of steel piping)

L55 ANSWER 39 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1992:638969 HCAPLUS

DN 117:238969

ED Entered STN: 13 Dec 1992

TI Removal of **carbon dioxide** from flue **gases** by scrubbing with milk of lime.

IN Pomplun, Dieter

PA Germany

SO Ger. Offen., 4 pp.

CODEN: GWXXBX

DT Patent

LA German

IC ICM B01D053-34

ICS F01N003-10; F01N005-02

CC 59-4 (**Air** Pollution and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 4038068	A1	19920604	DE 1990-4038068	19901129
PRAI	DE 1990-4038068		19901129		

AB **CO2** is removed from flue **gases** or from exhaust gases by scrubbing with milk of lime, producing calcium **carbonate** which is then calcined to form quicklime and CO2. The quicklime is quenched and the excess milk of lime is recycled to the process.

ST calcium hydroxide exhaust gas scrubbing; **waste gas** scrubbing lime milk; recycling lime milk gas scrubbing

IT Recycling  
(of calcium hydroxide, in scrubbing of **waste gases**)

IT Exhaust gases

Flue gases

(scrubbing of, calcium hydroxide in, recycling in)

IT **471-34-1P, Calcium carbonate**, preparation

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, in scrubbing **waste gases**, recycling in relation to)

IT 1305-62-0, Calcium hydroxide, miscellaneous

RL: MSC (Miscellaneous)

(recycling of, in removal of **carbon dioxide** from

flue gases)  
IT 124-38-9, Carbon dioxide, miscellaneous  
RL: REM (Removal or disposal); PROC (Process)  
(removal of, from waste gases by scrubbing with  
calcium hydroxide, recycling in)  
L55 ANSWER 40 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1991:253298 HCAPLUS  
DN 114:253298  
ED Entered STN: 28 Jun 1991  
TI Removal of carbon dioxide from waste  
gases  
IN Sato, Shinichiro; Kitajima, Nobuyuki; Yajima, Satoshi  
PA Fujita Corp., Japan  
SO Jpn. Kokai Tokkyo Koho, 3 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
IC ICM B01D053-34  
CC 59-4 (Air Pollution and Industrial Hygiene)  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 03056121	A2	19910311	JP 1989-188720	19890724
	JP 06075666	B4	19940928		
PRAI	JP 1989-188720		19890724		
AB	CO2 is removed from waste gases by contacting the gases with aqueous alkali to absorb CO2 as carbonate salts, subjecting the aqueous solns. to a CO2 fixation process using a culture tank containing alkalophilic bacteria or fungi, and recycling the carbonate -depleted culture medium as aqueous alkali in the CO2 absorption process. The method is simple and efficient and is useful for treatment of waste gases and flue gases from power plants, municipal incinerator plants, etc.				
ST	carbon dioxide removal waste gas; flue gas carbon dioxide removal; fixation biol carbon dioxide gas; scrubbing alkali gas carbon dioxide; alkalophilic bacteria carbon dioxide fixation				
IT	Fungi (alkalophilic, carbon dioxide fixation by, in waste gas treatment)				
IT	Spirulina platensis (carbon dioxide fixation by, in waste gas treatment)				
IT	Flue gases Waste gases (carbon dioxide removal from, by alkali scrubbing and biol. fixation)				
IT	Bacteria (alkalophilic, carbon dioxide fixation by, in waste gas treatment)				
IT	Scrubbing (wet, of waste gases, by aqueous alkali, for carbon dioxide removal)				
IT	124-38-9, Carbon dioxide, uses and miscellaneous				

RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from **waste gases**, by alkali scrubbing  
and biol. **fixation**)

L55 ANSWER 41 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1991:149330 HCAPLUS  
DN 114:149330  
ED Entered STN: 19 Apr 1991  
TI Process for selective absorption of chlorine from **waste gases** containing **carbon dioxide**  
IN Girrbach, Ulrich; Grimm, Richard; Haertl, Edgar; Malow, Egon  
PA Hoechst A.-G., Germany  
SO Eur. Pat. Appl., 4 pp.  
CODEN: EPXXDW  
DT Patent  
LA German  
IC ICM B01D053-34  
ICS B01D053-14  
CC 59-4 (Air Pollution and Industrial Hygiene)  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 406675	A1	19910109	EP 1990-112184	19900627
	EP 406675	B1	19940413		
	R: BE, CH, DE, FR, GB, IT, LI, NL				
	DE 3921714	A1	19910110	DE 1989-3921714	19890701
	JP 03131319	A2	19910604	JP 1990-170344	19900629
	BR 9003060	A	19910827	BR 1990-3060	19900629
	US 5102638	A	19920407	US 1990-546244	19900629
PRAI	DE 1989-3921714		19890701		
AB	Cl2 is selectively removed from <b>waste gases</b> containing <b>CO2</b> by scrubbing with an <b>aqueous</b> solution containing NaHCO3 0.1-10 and NaHSO3 0.01-5 weight%, preferably 1-5 and 0.1-0.5 wt%, resp.				
ST	chlorine scrubbing <b>waste gas</b> ; <b>bicarbonate</b> bisulfite <b>waste gas</b> scrubbing				
IT	<b>Waste gases</b> ( <b>carbon dioxide</b> -containing, selective removal of chlorine from, scrubbing with sodium <b>bicarbonate</b> and sodium bisulfite in)				
IT	Scrubbing (chlorine removal by, selective, from <b>waste gases</b> containing <b>carbon dioxide</b> , sodium <b>bicarbonate</b> and sodium bisulfite in)				
IT	7757-82-6, Disodium sulfate, uses and miscellaneous RL: USES (Uses) (in selective removal of chlorine, from <b>waste gases</b> containing <b>carbon dioxide</b> )				
IT	7647-14-5P, Sodium chloride, preparation RL: PREP (Preparation) (recovery of, in selective removal of chlorine, from <b>waste gases</b> containing <b>carbon dioxide</b> )				
IT	7782-50-5, Chlorine, uses and miscellaneous RL: <b>REM (Removal or disposal)</b> ; PROC (Process) (removal of, from <b>waste gases</b> containing <b>carbon dioxide</b> , by scrubbing with sodium <b>bicarbonate</b> and sodium bisulfite)				
IT	144-55-8, Sodium <b>bicarbonate</b> , uses and miscellaneous 7631-90-5 RL: USES (Uses)				

(scrubbing solution containing, for selective removal of chlorine, from  
waste gases containing carbon dioxide  
)

L55 ANSWER 42 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1991-092105 [13] WPIX

DNC C1991-039520

TI Removal and recovery of carbonic acid gas from exhaust gas - by  
absorbing gas using aqueous absorption liquid drawing off liquid and  
heating to release gas and regenerating absorption liquid.

DC E36 J01

PA (CHIY) CHIYODA CORP

CYC 1

PI JP 03038219 A 19910219 (199113)\*

JP 05021610 B 19930325 (199315) 5p B01D053-34

ADT JP 03038219 A JP 1989-109960 19890703; JP 05021610 B JP 1989-169960  
19890703

FDT JP 05021610 B Based on JP 03038219

PRAI JP 1989-109960 19890703; JP 1989-169960 19890703

IC ICM B01D053-34

ICS C01B031-20

AB JP 03038219 A UPAB: 19930928

Carbonic acid gas is recovered and removed from exhaust gas by:  
(1) Carbonic acid gas is absorbed by aqueous absorption  
liquid, (2) At least a part of the aqueous absorption liquid which has  
absorbed carbonic acid gas is drawn out and heated,  
carbonic acid gas is released and the aqueous absorption  
liquid is reed; and (3) the regenerated aqueous absorption liquid is  
cooled, and returned to the absorption process (1). The aqueous  
absorption liquid contains a slurry which mainly consists of Na  
carbonate and/or Na bicarbonate.

Pref. 02-containing oxidising gas is introduced to the aqueous  
absorption liquid during (1) or between (1) and (2).

USE/ADVANTAGE Acid gas, specially CO<sub>2</sub> and SO<sub>2</sub>, is  
removed from exhaust gas, and high purity carbonic acid  
gas is recovered. In the case of boiler exhaust gas,  
CO<sub>2</sub> can be recovered efficiently under conditions up to 150 deg.  
C. @ (5pp Dwg.No.0/2)

FS CPI

FA AB; DCN

MC CPI: E31-F01A; E31-N05C; E33-D; J01-E02A

L55 ANSWER 43 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1982-28653E [14] WPIX

TI Carbon di oxide measurement system - uses carrier stream for sample  
passage into spiral absorbing column which causes conductivity change.

DC E36 J04 S03

PA (CAME-I) CAMERON J N

CYC 1

PI US 4321545 A 19820323 (198214)\* 7p

PRAI US 1980-130086 19800313

IC G01N027-42

AB US 4321545 A UPAB: 19930915

In a CO<sub>2</sub> measuring system, a sample is injected into an extraction chamber  
containing an acid solution for converting bicarbonate ion,  
carbonate ion, and carbonic acid to dissolved  
CO<sub>2</sub> gas. A carrier gas stream removes  
the CO<sub>2</sub> from the chamber to a column for contact with an

alkaline solution which reabsorbs CO<sub>2</sub>.

The carrier gas circulates the alkaline solution through detector cells. Analog and digital circuitry provides an automatically switched counting period, at the end of which the sample concentration is displayed.

Used for analysis of natural surface **waters**, sea **water**, blood, urine samples, culture media and gas samples. Quick and convenient analysis of samples containing as little as 2 x 10 power (-8) Moles of CO<sub>2</sub> can be made with samples as small as 5 microlitres.

FS CPI EPI

FA AB

MC CPI: E31-N05; J04-B01; J04-C04

EPI: S03-E03A; S03-E13D

L55 ANSWER 44 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1982-97733E [46] WPIX

TI Waste **water** purificn. sludge treatment - with **carbonic** acid to convert iron-containing salt to soluble iron bi **carbonate** for recycling.

DC D15

IN KAEUFFER, K C

PA (AGSA-N) AGS AUSRUESTUNGSGES GEWAESSER; (KAUF-I) KAUFFER K C

CYC 8

PI EP 64279 A 19821110 (198246)\* DE 14p

R: AT CH FR GB LI NL SE

DE 3117513 A 19821118 (198247)

EP 64279 B 19850710 (198528) DE

R: AT CH FR GB LI NL SE

DE 3117513 C 19901004 (199040)

ADT EP 64279 A EP 1982-103661 19820429

PRAI DE 1981-3117513 19810502

REP DE 1136285; DE 1517526; DE 2603773; DE 641793; US 3268443; US 3377272

IC C02F001-52; C02F011-14

AB EP 64279 A UPAB: 19930915

Waste **water** purificn. comprises mixing a neutral or acid waste **water** with Fe salts and opt. flocking auxiliaries, separating the forming sludge from the pure **water** and treating with acid having a concentration such that the Fe-containing substances but not the organic contents

pass into the solution The solution obtd. is recycled to the neutral or acid waste **water**. Novelty consists of using H<sub>2</sub>CO<sub>3</sub> as the acid and Fe(HCO<sub>3</sub>)<sub>2</sub> as the Fe salt flocculant. The equipment used is claimed. Salt load formation in purified **water** is prevented.

Neutral waste **water** mixed with Fe(HCO<sub>3</sub>)<sub>2</sub> is freed from CO<sub>2</sub> by applying reduced pressure or by stripping with a gas, especially air. The sludge is separated from the pure **water** by sedimentation, flotation or opt. filtration. The H<sub>2</sub>CO<sub>3</sub> source can be flue **gas**.

CO<sub>2</sub> can be used under pressure. After sludge separation, the pure **water** is pref. passed through a cation exchanger, followed by CO<sub>2</sub> expulsion. Freed CO<sub>2</sub> is recycled as H<sub>2</sub>CO<sub>3</sub>.

FS CPI

FA AB

MC CPI: D04-B09

L55 ANSWER 45 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1983:131550 HCAPLUS

DN 98:131550

ED Entered STN: 12 May 1984

TI Activation of potassium **carbonate** solutions used in the

absorption of **carbon dioxide** from **gases**

AU Jianu, Dumitru

CS Cent. Cercetare Pentru Ingrasaminte Chim., Craiova, Rom.

SO Revistade Chimie (Bucharest, Romania) (1982), 33(12), 1122-4  
CODEN: RCBUAU; ISSN: 0034-7752

DT Journal

LA Romanian

CC 59-4 (**Air** Pollution and Industrial Hygiene)

AB The activation of K<sub>2</sub>CO<sub>3</sub> solns. by As<sub>2</sub>O<sub>3</sub>, aminoacetic acid [56-40-6], monoethanolamine [141-43-5], diethanolamine [111-42-2], morpholine [110-91-8], and glycerol [56-81-5] in the absorption of CO<sub>2</sub> from **gases** was studied.

ST potassium **carbonate** sorbent activation; **carbon dioxide** removal **waste gas**

IT **Waste gases**  
(**carbon dioxide** removal from, potassium **carbonate** solution for, activators for)

IT 1327-53-3 56-40-6, uses and miscellaneous 56-81-5, uses and miscellaneous 110-91-8, uses and miscellaneous 111-42-2, uses and miscellaneous 141-43-5, uses and miscellaneous  
RL: OCCU (Occurrence)  
(in activation of potassium **carbonate** solns. for **carbon dioxide** removal from **gases**)

IT 124-38-9, uses and miscellaneous  
RL: REM (**Removal or disposal**); PROC (Process)  
(removal of, from **gases** by adsorption in potassium **carbonate** solns., activators for)

IT 584-08-7  
RL: OCCU (Occurrence)  
(solution of, for **carbon dioxide** removal from **gases**, activators for)

L55 ANSWER 46 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1980:452997 HCAPLUS

DN 93:52997

ED Entered STN: 12 May 1984

TI Wet dust removal from gases

IN Krueger, Berthold

PA Bischoff, Gottfried, Bau Kompletter. Gasreinigungs- und Wasserrueckkuehlanlagen G.m.b.H. und Co. K.-G., Fed. Rep. Ger.

SO Rom., 3 pp.  
CODEN: RUXXA3

DT Patent

LA Romanian

IC B01D047-00; B01D053-00

CC 59-2 (**Air** Pollution and Industrial Hygiene)

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	RO 65892	P	19790115	RO 1974-80192	19741011
	DE 2350956	B1	19740516	DE 1973-2350956	19731011
PRAI	DE 1973-2350956		19731011		

AB **Gases** containing CaO and CO<sub>2</sub> were scrubbed with **water** containing 0.4-1 g Na<sub>2</sub>CO<sub>3</sub> or NaOH to remove dust. The Na<sub>2</sub>CO<sub>3</sub> or NaOH prevented CaCO<sub>3</sub> formation.

ST wet scrubbing dust calcium oxide

IT Dust  
(removal of, from **waste gases**, scrubbing with solution)

containing sodium **carbonate** or sodium hydroxide to prevent calcium **carbonate** formation)

IT Scrubbing  
(wet, of **waste gases** for dust removal, solution containing sodium **carbonate** or hydroxide for)

IT **124-38-9**, uses and miscellaneous 1305-78-8, uses and miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from **waste gases** by scrubbing with solution containing sodium **carbonate** or hydroxide)

IT 497-19-8, uses and miscellaneous 1310-73-2, uses and miscellaneous  
RL: **USES (Uses)**  
(scrubbing of **waste gases** containing **carbon dioxide** with solution containing, for calcium oxide removal)

L55 ANSWER 47 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
AN 1978:411430 HCAPLUS  
DN 89:11430  
ED Entered STN: 12 May 1984  
TI Method of removing hydrogen sulfide from a **gas carbon dioxide**  
IN Schievelbein, Vernon Hugo  
PA Texaco Development Corp., USA  
SO Brit., 9 pp.  
CODEN: BRXXAA  
DT Patent  
LA English  
IC B01D053-34  
CC 59-2 (Air Pollution and Industrial Hygiene)  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	GB 1495690	A	19771221	GB 1975-49130	19751129
PRAI	GB 1975-49130		19751129		
AB	A process is described for the preferential removal of H <sub>2</sub> S from effluent gas streams containing a mixture of H <sub>2</sub> S and <b>CO<sub>2</sub></b> by contacting the <b>waste gas</b> with <b>aqueous</b> NaHCO <sub>3</sub> and catalytic oxidation of the dissolved H <sub>2</sub> S. Thus, a <b>waste gas</b> stream containing 95.5% <b>CO<sub>2</sub></b> and 4.5% H <sub>2</sub> S was contacted by counter-current flow with an <b>aqueous</b> liquid containing O, NaHCO <sub>3</sub> , and a NiCl catalyst. Contact time was .apprx.2 s. The purifd. gas contained 0.27% H <sub>2</sub> S.				
ST	hydrogen sulfide removal <b>waste gas</b> ; catalytic oxidn hydrogen sulfide; nickel chloride oxidn catalyst; <b>bicarbonate</b> scrubbing hydrogen sulfide; carbon dioxide sepn hydrogen sulfide				
IT	<b>Waste gases</b> (hydrogen sulfide removal from <b>carbon dioxide</b> -containing, by scrubbing with <b>aqueous</b> sodium <b>bicarbonate</b> and catalytic oxidation)				
IT	Scrubbing (of hydrogen sulfide, from <b>waste gases</b> by <b>aqueous</b> sodium <b>bicarbonate</b> )				
IT	37211-05-5 RL: CAT (Catalyst use); <b>USES (Uses)</b> (catalyst, for oxidation of hydrogen sulfide in <b>waste gas</b> purification)				
IT	124-38-9, uses and miscellaneous RL: <b>USES (Uses)</b> (hydrogen sulfide removal from gases containing, by scrubbing with				

IT aqueous sodium bicarbonate and catalytic oxidation)  
 7783-06-4, uses and miscellaneous  
 RL: REM (Removal or disposal); PROC (Process)  
 (removal of, from waste gases containing carbon  
 dioxide)  
 IT 144-55-8, uses and miscellaneous  
 RL: USES (Uses)  
 (scrubbing by aqueous, of hydrogen sulfide from waste  
 gases containing carbon dioxide)

L55 ANSWER 48 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1976:126270 HCAPLUS  
 DN 84:126270  
 ED Entered STN: 12 May 1984  
 TI Removing hydrogen sulfide from a gas containing carbon  
 dioxide  
 IN Schievelbein, Vernon H.  
 PA Texaco Inc., USA  
 SO U.S., 7 pp.  
 CODEN: USXXAM  
 DT Patent  
 LA English  
 IC B01D  
 NCL 423232000  
 CC 59-2 (Air Pollution and Industrial Hygiene)  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3932583	A	19760113	US 1974-462907	19740422
PRAI	US 1972-263911		19720619		
AB	H2S [7783-06-4] present in mixts. with CO2 could be removed by treating the mixture with aqueous NaHCO3 [144-55-8] solution containing nickel chloride [7718-54-9] and dissolved O. Thus, a gas comprising 95.5% CO2 and 4.5% H2S when bubbled into aqueous solution containing NaHCO3, NiCl2, and O, the H2S content was reduced to 0.27%.				
ST	hydrogen sulfide bicarbonate removal; nickel chloride catalyst sulfide				
IT	Waste gases (hydrogen sulfide removal from, scrubber solution containing sodium bicarbonate and nickel chloride in)				
IT	Oxidation catalysts (nickel chloride, in removing hydrogen sulfide from gases containing carbon dioxide)				
IT	7718-54-9 RL: CAT (Catalyst use); USES (Uses) (catalysts, for oxidation of hydrogen sulfide)				
IT	144-55-8, uses and miscellaneous RL: USES (Uses) (for removing of hydrogen sulfide from gas containing carbon dioxide)				
IT	7783-06-4, uses and miscellaneous RL: REM (Removal or disposal); PROC (Process) (removal of, from gases containing carbon dioxide, scrubber solution containing sodium bicarbonate and nickel chloride in)				

L55 ANSWER 49 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1977:194422 HCAPLUS



DN 86:194422  
 ED Entered STN: 12 May 1984  
 TI Eliminating hydrogen sulfide from a **gas** mixture containing  
**carbon dioxide**  
 PA Texaco Development Corp., USA  
 SO Belg., 23 pp.  
 CODEN: BEXXAL  
 DT Patent  
 LA French  
 IC B01D  
 CC 59-2 (Air Pollution and Industrial Hygiene)  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	BE 836821	A1	19760618	BE 1975-162895	19751218
PRAI	BE 1975-162895		19751218		
AB	<b>Gas</b> mixts. containing large excesses of <b>CO2</b> and contaminated with H2S were contacted with <b>aqueous</b> solns. of 0.01-0.25 mol <b>bicarbonate</b> ions/L to remove most of the H2S. A gas mixture containing 3.67% H2S and 96.33% CO2 was bubbled through an <b>aqueous</b> NaHCO3 solution so that the contact time was 3 s and the treated gas composition was 0.76% H2S and 99.24% CO2. The amount of H2S was reduced from 4.5 to 0.27% on contact with a NaHCO3 solution in the presence of O and NiCl2 catalyst.				
ST	hydrogen sulfide removal <b>bicarbonate</b> ; carbon dioxide purifn <b>bicarbonate</b> ; hydrogen sulfide removal carbon dioxide; sodium <b>bicarbonate</b> soln acid removal				
IT	<b>Waste gases</b> (hydrogen sulfide removal from, sodium <b>bicarbonate</b> solution in)				
IT	124-38-9P, preparation RL: PREP (Preparation) (hydrogen sulfide removal from, sodium <b>bicarbonate</b> in)				
IT	144-55-8, uses and miscellaneous RL: USES (Uses) (in hydrogen sulfide removal from <b>waste gases</b> )				
IT	7783-06-4, uses and miscellaneous RL: <b>REM (Removal or disposal)</b> ; PROC (Process) (removal of, from <b>carbon dioxide</b> -containing <b>gases</b> , sodium <b>bicarbonate</b> solution in)				

L55 ANSWER 50 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN  
 AN 1976:21682 HCAPLUS  
 DN 84:21682  
 ED Entered STN: 12 May 1984  
 TI Disposal of off-**gases** containing **carbon dioxide** and chlorine  
 IN Hirdler, Louis C.  
 PA Olin Corp., USA  
 SO U.S., 5 pp.  
 CODEN: USXXAM  
 DT Patent  
 LA English  
 IC B01D; C01B; C07D  
 NCL 423232000  
 CC 59-2 (**Air Pollution** and Industrial Hygiene)  
 Section cross-reference(s): 49  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3896213	A	19750722	US 1973-376491	19730705
PRAI	US 1973-376491		19730705		
AB	A process is described for disposing of off-gases comprised of a <b>gaseous</b> mixture of Cl [7782-50-5] and <b>CO2</b> [124-38-9], such as that from HClO [7790-92-3] generators. The off-gases are reacted with an <b>aqueous</b> solution of an alkaline compound and a reducing agent to produce a substantially neutral <b>aqueous</b> solution containing alkali metal salts that can be safely discarded. To produce HClO by the reaction of an <b>aqueous</b> solution of an alkali metal hydroxide with Cl gas, an alkali metal hypochlorite solution is first formed, which upon further chlorination produces a solution containing HClO. Frequently the				
Cl	gas used as the chlorinating agent is mixed with other <b>gases</b> , such as <b>CO2</b> or air. When <b>CO2</b> is present with the Cl in the reaction with the alkali metal hydroxide solution, the initial reaction gives a solution containing an alkali metal hypochlorite, an alkali metal chloride				
and	an alkali <b>carbonate</b> . This solution upon further chlorination in a second stage produces HClO and regenerates <b>CO2</b> . Part of the <b>CO2</b> formed is dissolved in the HClO solution produced and the remainder is in the form of a gaseous mixture with Cl. The HClO solution can be used in a chlorination process. There is a need at the present time for utilizing impure Cl <b>gases</b> containing <b>CO2</b> in the production of HClO while preventing an excessive buildup of <b>CO2</b> .				
ST	hypochlorite <b>waste gas</b> treatment				
IT	<b>Waste gases</b> (chlorine and <b>carbon dioxide</b> removal from, in hypochlorous acid manufacture)				
IT	7790-92-3P RL: IMF (Industrial manufacture); PREP (Preparation) (manufacture of, disposal of <b>waste gas</b> containing chlorine and <b>carbon dioxide</b> in)				
IT	124-38-9, uses and miscellaneous 7782-50-5, uses and miscellaneous RL: <b>REM (Removal or disposal)</b> ; PROC (Process) (removal of, from <b>waste gas</b> in hypochlorous acid manufacture)				
L55	ANSWER 51 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN				
AN	1975:415090 HCAPLUS				
DN	83:15090				
ED	Entered STN: 12 May 1984				
TI	Regenerative sorption of carbon dioxide				
IN	Gidaspow, Dimitri; Onischak, Michael				
PA	Institute of Gas Technology				
SO	U.S., 11 pp. CODEN: USXXAM				
DT	Patent				
LA	English				
IC	B01D				
NCL	423230000				
CC	59-2 ( <b>Air Pollution</b> and Industrial Hygiene)				
FAN.CNT	1				
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3865924	A	19750211	US 1972-231530	19720303

PRAI US 1972-231530

19720303

AB **CO2** is removed from a **gaseous** stream by contacting the stream with a synergistic sorbent composition of finely divided particulate alkali metal **carbonate** and dried de Gussa type C alumina, both of which consist of separate discrete **hydrated** particles. During sorption of **CO2** the **CO32-** is converted to **HCO3-**. The sorbent composition is subsequently regenerated thermally to reconvert the **HCO3-** to **CO32-** while evolving **CO2** from the sorbent without forming a crust over the sorbent. The **carbonate** is an alkali metal **carbonates**, e.g. **K2CO3**, **Na2CO3**, **Rb2CO3**, or **Cs2CO3**. The rate of sorption of **CO2** is essentially independent of temperature at 20-60° and independent of the humidity or **water** content of the salt mixture as long as sufficient **water** is present in the salt mixture for the **CO32-** → **HCO3-** reaction to occur. The system continuously removes **CO2** from a 1st **gaseous** stream, containing from trace amts. of **CO2** to < 50 mole %, and transfer to a 2nd, more concentrated, gaseous stream.

ST **carbon dioxide** removal **waste gas**;  
sorption regeneration carbon dioxide

IT **Waste gases**  
(**carbon dioxide** removal from, sorbent containing alumina and potassium **carbonate** in, thermal regeneration of)

IT **124-38-9**, uses and miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from **waste gas** by sorbent containing alumina and potassium **carbonate**, sorbent regeneration in)

IT 584-08-7  
RL: OCCU (Occurrence)  
(**waste gas** treatment by sorbent containing alumina and, **carbon dioxide** removal by, thermal regeneration of sorbent in)

IT 1344-28-1, uses and miscellaneous  
RL: USES (Uses)  
(**waste gas** treatment by sorbent from potassium **carbonate** and, carbon dioxide removal by, thermal regeneration of sorbent in)

L55 ANSWER 52 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1975:551668 HCAPLUS

DN 83:151668

ED Entered STN: 12 May 1984

TI Treatment of a stack gas

IN Sawada, Seiji; Kaneko, Yoshitomi; Kiga, Yoshitaro; Kikuchi, Motoyoshi

PA Nippon Soda Co., Ltd., Japan

SO Jpn. Tokkyo Koho, 3 pp.

CODEN: JAXXAD

DT Patent

LA Japanese

IC B01D; C01D; B01K

CC 59-2 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 50010542	B4	19750422	JP 1970-32983	19700420
PRAI	JP 1970-32983		19700420		

AB A method is described for treating **SO2** in stack gas with **NaOH** produced by electrolysis of **NaCl** to recover **NaHCO3** and **NaHSO3**, and calcining the **bicarbonate** and bisulfite to produce **CO2** and **SO2**. The method

comprises the following steps: (a) treating an **aqueous** solution or a suspension of  $\text{NaHCO}_3$  with the stack **gas** containing  $\text{SO}_2$  and  $\text{CO}_2$  to produce an **aqueous** solution of  $\text{NaHSO}_3$  and a **waste gas** substantially containing no  $\text{SO}_2$ ; (b) treating the **waste gas** with a solution of  $\text{NaOH}$  produced by electrolysis of  $\text{NaCl}$ , thereby reacting  $\text{CO}_2$  of the **waste gas** with  $\text{NaOH}$  of the solution to precipitate  $\text{NaHCO}_3$ , and thereafter separating the precipitated

**bicarbonate** to produce a mother liquor; (c) neutralizing the mother liquor with  $\text{HCl}$  to produce an **aqueous** solution of  $\text{NaCl}$ , and recycling the  $\text{NaCl}$  solution to the electrolysis process.

ST stack gas sulfur dioxide; **bicarbonate** stack gas sulfur dioxide; **carbon dioxide** stack gas

IT Flue **gases**

(sulfur dioxide and **carbon dioxide** removal from, by scrubber solution containing sodium **bicarbonate** and sodium hydroxide)

IT 7647-14-5, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)  
(electrolysis of, sodium hydroxide manufacture from, for **carbon dioxide** removal from flue **gas**)

IT 1310-73-2, uses and miscellaneous

RL: USES (Uses)  
(flue **gas** treatment by scrubber solution containing, **carbon dioxide** removal by)

IT 144-55-8, uses and miscellaneous

RL: USES (Uses)  
(flue gas treatment by scrubber solution containing, sulfur dioxide removal by)

IT 7446-09-5, uses and miscellaneous

RL: REM (Removal or disposal); PROC (Process)  
(removal of, from flue gas by scrubber solution containing sodium **bicarbonate**)

IT 124-38-9, uses and miscellaneous

RL: REM (Removal or disposal); PROC (Process)  
(removal of, from flue gas, scrubber solution containing sodium hydroxide

in)

L55 ANSWER 53 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1974:63443 HCAPLUS

DN 80:63443

ED Entered STN: 12 May 1984

TI Removal of acidic gases from gaseous mixtures

IN Thirkell, Harry

SO U.S., 13 pp.

CODEN: USXXAM

DT Patent

LA English

IC B01D

NCL 423223000

CC 59-2 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3773895	A	19731120	US 1971-208499	19711215
PRAI	US 1966-587274		19661017		
	US 1970-56174		19700709		

AB In a 2-stage scrubbing system for the removal of acidic gases using alkali

metal **carbonates** or alkali metal phosphates and an alkanolamine, the operation is improved by (1) passing supplementary stripping steam to the 1st regeneration zone and (2) heating spent absorbent solution leaving the 2nd absorption zone by indirect heat exchange with hot spent absorbent solution leaving the 1st absorption zone. In an example, 155,663 m3/hr of **gas** containing 21.92 volume % **CO2** at 273 psia and 240°F is scrubbed successively with (1) 3,570,000 lg/hr of **aqueous** solution at 226°F containing 30 weight % K2CO3 and 3 weight % diethanolamine and (2) 438,000 lb/hr of **aqueous** solution at 122° F containing 20 weight % diethanolamine. Purified **gas** containing 0.1 volume % **CO2** is produced at 121,478 m3/hr. Spent solution, containing 10,260 lb CO2/hr, from

the

2nd absorber is heated from 190 to 230°F by exchange with 1st absorber spent solution before entering the 2nd stage (19 psia) regenerator. Stripping steam, put into the 2nd stage at a rate sufficient only for satisfactory regeneration of spent absorbent in this zone, passes into the 1st stage regenerator where addnl. stripping steam is produced by a heating coil. Heat input to the 2nd stage reboiler and stripping steam generator and to the coil for addnl. steam is 105 + 106 btu/hr. Similarly, monoethanolamine is used with regenerator bottom pressures of 0.23 and 2.5 kg/cm2, resp.

ST acidic gas removal alkanolamine; carbon dioxide removal alkanolamine; diethanolamine carbon dioxide removal

IT **Waste gases**

(**carbon dioxide** removal from, ethanolamine and potassium **carbonate** scrubber solution in)

IT 124-38-9, uses and miscellaneous

RL: **REM (Removal or disposal)**; PROC (Process)

(removal of, from **waste gas**, ethanolamine and potassium **carbonate** scrubber solution in)

IT 111-42-2, uses and miscellaneous 141-43-5, uses and miscellaneous 584-08-7

RL: **USES (Uses)**

(**waste gas** treatment by scrubber solution containing, **carbon dioxide** removal in)

L55 ANSWER 54 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1973:549217 HCAPLUS

DN 79:149217

ED Entered STN: 12 May 1984

TI Treating alkaline waste **water** containing sulfides and acidic oils

IN Arita, Hideo

PA Chisso Engineering Co., Ltd.

SO Jpn. Kokai Tokkyo Koho, 4 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

NCL 91C91; 13(7)A31; 91C92

CC 60-2 (Sewage and Wastes)

Section cross-reference(s): 51

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 48059666	A2	19730821	JP 1971-95051	19711126
	JP 53043734	B4	19781122		
	CS 170186	P	19760827	CS 1972-3090	19720506
PRAI	JP 1971-95051		19711126		

- AB In purifying a **gas** containing at least H<sub>2</sub>S, CO<sub>2</sub>, and vapors of acidic oils by scrubbing with a caustic alkali, the by-product alkali waste **water** containing at least alkali sulfide and acidic oils is contacted at .apprx.1 atm with CO<sub>2</sub>, which reacts with **water** to form acidic HCO<sub>3</sub><sup>-</sup> at .apprx.1 atmospheric. The alkali sulfide is thus decomposed to H<sub>2</sub>S; the alkali salts of the acidic oils are decomposed to free the acidic oils, and a solution of alkali carbonate containing alkali **bicarbonate** is formed. Thus, an alkali waste **water** (1000 cm<sup>3</sup>/hr) containing Na<sub>2</sub>S 6.23, Na<sub>2</sub>CO<sub>3</sub> 3.58 NaOH 0.21, Na salts of acidic oils (1.5 g/100 cm<sup>3</sup>) from naphtha crackers in an C<sub>2</sub>H<sub>4</sub> plant was contacted countercurrently with 98% CO<sub>2</sub> (50-60 l./hr) at 1.01 atmospheric in an absorber. The absorption solution was settled, and acidic oils were separated. The Na<sub>2</sub>S content in the **aqueous** solution was reduced to 0.16-0.36 g/100 cm<sup>3</sup>, and the content of the acidic oils was reduced to a trace. The **aqueous** solution was treated with a small amount of NaClO to decompose the residual sulfides and H<sub>2</sub>S. After removing the precipitate, the solution was concentrated to yield Na<sub>2</sub>CO<sub>3</sub> crystals.
- ST alk wastewater treatment; carbon dioxide treatment wastewater; sulfide wastewater treatment; oil wastewater treatment; naphtha cracking wastewater treatment
- IT Waste **water** treatment  
(oil and sulfide removal, from **waste gas** scrubber solution, **carbon dioxide** in)
- IT Hydrocarbon oils  
Sulfides, uses and miscellaneous  
RL: **REM (Removal or disposal)**; PROC (Process)  
(removal of, from **waste gas** scrubber solution, **carbon dioxide** in)
- IT 124-38-9, uses and miscellaneous  
RL: **USES (Uses)**  
(waste **water** treatment by, hydrocarbon oil and sulfide removal in)

=&gt;